The Design, Administration, and Evaluation of the 1978 Selected Reserve Reenlistment Bonus Test

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SEE REVERSE SIDE

THIS REPORT

describes the results of a national
experiment designed to study factors that
influence reenlistment decisions of Army
Reserve and National Guard personnel. Some
15,300 reservists making reenlistment
decisions in 1978 participated in the
experiment. The effect of bonuses given
for 3-year terms ($900) or 6-year terms
($1800) on reenlistment rates and length of
commitment was estimated by comparing the
responses of the group offered the bonus
with those of a matching control group.
While the bonus raised reenlistment rates
only from 38.4 to 40.6 percent, it
lengthened the average committed term of
service from 1.3 to 4.4 years.
Longitudinal tracking of test participants
indicates that a significant strength gain
will result from the longer term of service
committment. Two years after the test
began, 37.3 percent of the original bonus
group remained in service, while only 30.4
percent of the control group remained. ⟵
(See also R-2864, R-2866 (forthcoming),
N-1926 (forthcoming), N-1980
(forthcoming).)

R-2865-MRAL

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July 1982

Rand
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PREFACE

This report describes the design, administration, and evaluation of
the 1978 Army Selected Reserve Reenlistment Bonus Test, conducted for
the Office of the Deputy Assistant Secretary of Defense (Reserve
Affairs). It was prepared as part of Rand's Manpower, Mobilization, and
Readiness Program, sponsored by the Office of the Assistant Secretary of
Defense (Manpower, Reserve Affairs and Logistics)--OASD (MRA&L). The
Rand program seeks to develop broad strategies and specific solutions
for dealing with present and future defense manpower problems. The
evaluation was conducted under Task Orders 78-III-1, 79-III-1, and
80-III-1, Reserve Forces Manpower.

The 1978 Selected Reserve Reenlistment Bonus Test was initiated as
part of an effort to stem a severe decline in Army Selected Reserve
strength. The test consisted of offering a bonus to reservists with
less than eight years of service who faced a reenlistment decision in
1978. The Rand Corporation helped to design the test, monitored its
implementation in the Army Reserve and National Guard, and evaluated the
effects of the bonus offer.

This report, one of five publications documenting the 1978 Selected
Reserve Reenlistment Bonus Test, describes the design and administration
of the test and evaluates the effect of a bonus offer on the
reenlistment decision and years served. A forthcoming companion report,
A Model of Reenlistment Decisions of Army National Guardsmen,
R-2866-MRAL, analyzes the factors underlying a reservist's decision to
separate from or reenlist in the reserve. Data Bases for the 1978
Selected Reserve Reenlistment Bonus Test, N-1826-MRAL, forthcoming,
contains the technical documentation for the data used in all of the
analyses. A fourth publication, A Follow-up of Participants in the
1978 Selected Reserve Reenlistment Bonus Test, N-1880-MRAL,
forthcoming, analyzes the attrition of the test sample 3-1/2 years after
the initiation of the test. The 1978 Selected Reserve Reenlistment
Bonus Test: Executive Summary, R-2864-MRAL, April 1982, summarizes
the test results.

This report should be of interest to policymakers dealing with
reserve manning problems. It may also be of use to the wider military
manpower community to the extent that the experimental techniques
employed can also be applied in other policy areas for program
evaluation.

SUMMARY

Following the termination of the draft in January 1973, the number
of enlisted personnel in the Army Selected Reserve components (the Army
Selected Reserve and Army National Guard) declined for 4 successive
years. Reserve ranks, which stood at 638,000 in June 1973, numbered
only 527,000 in September 1978. Although this decline was later
reversed, it raised serious concerns in the mid-1970s about the
viability of the Army Selected Reserve in the All-Volunteer Force (AVF).
Under the total force policy, the success of the AVF depends on a strong
reserve supporting a smaller and less rapidly expandable active force.
The failure of the Selected Reserve to meet strength goals, it was
believed, might endanger the entire AVF concept, and, in fact, the
decline of reserve strength triggered congressional recommendations to
return to a draft. Such drastic solutions were suggested because the
decline was not understood and therefore great uncertainty surrounded
predictions about the results of policies to boost strength.

This report describes the results of research that sought to
explain the decline and predicts the effect of the bonus on future
reserve strength. The research was undertaken in response to a 1977
congressional authorization of $5 million to evaluate the effect of a
bonus on reenlistment in the Army National Guard and Army Selected
Reserve. The authorization bill specified the amount and t ning of
bonus payments to be tested and the eligibility requirements for bonus
recipients. Bonuses of $1800 were offered for a 6-year reenlistment and
$900 for a 3-year reenlistment, one-half ($900 or $450) to be paid at
the time of reenlistment and the remaining amount in $150 installments
at the completion of each obligated year of service. Reservists
extending their commitment for fewer than 3 years were not eligible.

The bonus program sought to lengthen the term of commitment, as
well as to increase the reenlistment rate. Before the test, most
reservists who did not separate extended their term for only 1 year.
Bonus test planners hoped that longer commitments would reduce future
separations by moving the next reenlistment decision to a career point
where the influence of the retirement system would be decisive. The

retention rate increases dramatically after 8 years of service, probably because of the attractiveness of reserve retirement benefits. Bonuses were therefore offered only to reservists who had served for fewer than 8 years, that is, reservists at a critical career juncture, who were deciding either to reenlist for the first time after an initial 3-year or 6-year term, or to reenlist for a second or third term.

So that the effect of the bonus could be evaluated, the test was experimentally designed to include bonus and control regions. Bonus payments were offered to National Guardsmen in six states and to reservists in four Army Reserve regions. Each of these areas was matched with a state or region where bonus payments were not offered, based on estimates of past retention behavior and the economic character of the region. The aggregate characteristics of test and control regions were also closely matched to national characteristics so that the results could be extrapolated.

Approximately 15,300 guardsmen and reservists in the test and control regions met the eligibility conditions and constituted the experimental sample. Of these, almost 75 percent represented the National Guard. The predominance of guardsmen resulted, first, from Congress's allocation of $3 million to the guard but only $2 million to the reserve to conduct the test. Second, because the Army Reserve has higher retention rates than the guard, fewer reservists would have been eligible to participate even if more bonus money had been available.

The reenlistment decision of each member of the experimental sample in both the test and control regions was monitored. These administrative data were combined with demographic and military background information collected from computerized personnel files to evaluate the effect of the bonus by a statistical comparison of behavior in bonus and control areas. The information from the computerized files was used to control for small differences in the composition of the test and control groups. As a by-product of the bonus analysis, the effects of certain demographic and military background variables on retention were measured.

Bonuses offered in the 1978 Selected Reserve Reenlistment Bonus Test had a small, but statistically significant, effect on reenlistment rates and definitely encouraged longer terms of commitment. Although

the bonus increased a recipient's income from reserve service by 20 to 40 percent during the 3- or 6-year term, it raised reenlistment rates only from 38.4 percent in control regions to 40.6 percent in bonus regions. Among reservists who reenlisted, however, 82 percent of those in test regions selected 3- or 6-year terms, while only 13 percent of those in control regions did so. The average term of commitment amounted to 4.4 years for the test region and 1.3 years for the control region.

Longer terms of commitment, however, do not automatically translate into higher strength levels, which depend on whether those choosing shorter terms in control regions remain in service as long as those with longer commitments in test regions. For instance, those who reenlisted for only 1 year may continue to reenlist for 1 year at a time, or those who reenlisted for 3 or 6 years may leave before completing their commitment. To find out whether longer terms of commitment result in additional man-years, participants in the test were tracked 1-1/2 years after their initial decision.

Of those in the original 15,000-member sample, 37.3 percent of the test group, but only 30.4 percent of the control group, remained in the reserve 1-1/2 years later. Given an annual choice to reenlist or separate, many reservists left, perhaps influenced by new situations arising in their civilian work or family life. The bonus incentive, however, apparently encouraged those who had made longer commitments to honor those commitments and, by reducing attrition, resulted in higher strength levels.

Thanks mainly to reduced attrition, the bonus will leave an imprint on reserve strength over the entire career span of the participants. Viewed from this longer term perspective, the bonus offer will have proved effective, provided the differences in manning between test and control groups continue until the test participants retire. Evaluating the effects of the bonus, in theory, entails following up the participants over this career span. However, the major attrition effects will occur over a 6-year period--the longest term induced by the bonus. Beyond 6 years, the differences in participation between bonus and nonbonus groups will likely remain stable. Thus, the total bonus effect may be estimated by tracking attrition behavior for 6 years.

Longer terms of commitment have other benefits for the reserve. They reduce administrative costs associated with record keeping and retention counseling. They may also improve the credibility and reliability of reserve units in mobilization for international crises. By decreasing the opportunity for reservists to separate before mobilization, longer terms of commitment may increase readiness.

Despite the incentive of a bonus, 62 percent of the reservists in the total sample separated at the end of their term. The presence of men who entered the reserve under draft pressure contributed to this high separation rate. Most guardsmen and reservists in the sample who entered in 1972, the last year of the draft, had low lottery numbers and would have been drafted had they not entered the reserve. Not unexpectedly, they reenlisted at a significantly lower rate than first-term nondraft-motivated reservists in the sample. Only 21 percent of the draft-motivated but 45 percent of the nondraft-motivated first termers reenlisted.

These differences in reenlistment rates help to explain the decline in Army Selected Reserve strength during the early AVF years. Part of the decline was apparently a temporary transition phenomenon associated with the large number of draft-motivated personnel remaining in the Army Selected Reserve components after the draft ended. These draft-motivated men depressed reenlistment rates, thus causing high losses at first-term reenlistment. The loss rate remained high through 1978, the last year in which first-term draft-motivated youths were still present in the reserve. After 1978, those reaching first-term reenlistment decisions were all volunteers, who reenlist at much higher rates. In fact, the downward trend in Army Selected Reserve component strength was reversed in 1979.

In rebuilding reserve strength, policymakers require accurate estimates of reserve retention under various reserve policy options, especially options dealing with reserve pay. To estimate retention accurately, our research suggests that the estimates must take into account the demographic composition of the cohorts approaching reenlistment decisions, their prior military experience, and their economic circumstances. Our measurements show strong statistical sensitivity to these variables. Other things equal, reservists who are

older, less educated, nonwhite, and married with dependents have higher retention rates than their counterparts. Moreover, the composition of the volunteer cohorts moving toward reenlistment decisions has changed since the beginning of the AVF to include more reservists who are older, married, and members of a minority group. These changes in composition will tend to increase reserve retention rates.

Among previous military experience variables, we found significantly higher retention associated with the achievement of higher pay grades and lower retention among those with combat jobs. Other things equal, Army reservists displayed higher retention rates than National Guardsmen.

Reserve retention rates are also sensitive to civilian income and unemployment. Other things equal, higher retention occurs with lower per capita income and higher unemployment. Thus, overall reserve strength will respond to national economic cycles, and local unit strength will be sensitive to permanent changes in the economic climate of the community.

The Gates Commission, convened in 1970 to make recommendations concerning the All-Volunteer Force, concluded that the reserve components could maintain their pre-AVF strength level only with certain specified pay increases. Although increases given in 1971 and 1972 exceeded commission recommendations, reserve strength nevertheless declined, possibly because the commission had overestimated the responsiveness of reservists to pay increases. If reservists respond to pay increases, policies to rebuild reserve strength need not involve high costs. If, however, reservists require large financial inducements to reenlist, nonpay options must be thoroughly evaluated before pay is increased.

The results of the bonus evaluation alone cannot unambiguously settle the important question concerning the responsiveness of reservists to monetary incentives. The bonus might be expected to bring a smaller response than a pay raise because it requires a longer commitment and continues only for that specific term of service; in other words, a bonus does not represent a permanent pay increase and would not enter into the reserve base pay used to calculate future pay increases and retirement pay levels.

Thus, although reenlistment rates rose only slightly in response to a sizable bonus, we cannot extrapolate this effect to a pure reserve pay increase. Survey data collected during the test, however, allow a measurement of the effect of reserve pay differentials. These results (see A Model of Reenlistment Decisions of Army National Guardsmen, R-2866-MRAL, forthcoming) also suggest a much smaller pay responsiveness than was assumed by the Gates Commission. Thus, additional reserve pay over that recommended for the reserve force would have been required to stabilize reserve strength at pre-AVF levels.

ACKNOWLEDGMENTS

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I. INTRODUCTION

The 1978 Selected Reserve Reenlistment Bonus Test was undertaken as part of an effort to stem a severe decline in the strength of the Army Selected Reserve components, which had dropped from 621,000 in FY 1973, when the All-Volunteer Force (AVF) came into being, to 527,000 in FY 1978. This decline threatened the success of the entire AVF concept, which called for a smaller, less rapidly expandable active force, complemented by an enlarged reserve force to meet mobilization requirements. To fulfill this mission, the reserve had to be brought back up to pre-AVF strength levels.

The reserve can be strengthened by increasing enlistments and/or the retention rates of personnel already in the reserve, and programs were initiated in 1977 and 1978 to raise both enlistment and retention. In connection with these programs, Congress mandated a test of reenlistment bonus payments to a sample of reservists in the Army Selected Reserve components.

The decision to test a reenlistment bonus, rather than to increase reserve pay immediately, provided a major opportunity to conduct empirical research on several aspects of reserve policy, research that had been lacking up to that time. The original test objective of determining the effect of a bonus on the reserve participation decision was consequently broadened to include a description and explanation of the reenlistment decision. As the first test of a military compensation initiative, the bonus test also provided the opportunity to assess the feasibility of using experiments to shape military compensation policy. While large-scale social experiments have been used to study and set policy in large domestic programs, such as welfare, housing, and education, they have not been extensively used to analyze military personnel policy.

This report describes the design, administration, and evaluation of the 1978 Selected Reserve Reenlistment Bonus Test. The remainder of this section presents background information on the Selected Reserve: its organization and defense mission, its transition to an All-Volunteer

Force, and theories of reserve participation.   Section II details the designing and administering of the test.   Section III describes the characteristics of the test sample and outlines the analyses.   Section IV analyzes the effect of the bonus.   Section V offers conclusions and policy implications.

ORGANIZATION AND MISSION OF THE SELECTED RESERVE

The law establishes seven reserve components: Army National Guard of the United States; Army Reserve; Naval Reserve; Marine Corps Reserve; Air National Guard of the United States; Air Force Reserve; and Coast Guard Reserve.   The purpose of each reserve component is to provide trained units and qualified personnel for active duty in time of war or national emergency and at such other times as the national security requires.

The law also specifies three categories of reserves in each armed service: Ready Reserve; Standby Reserve; and Retired Reserve.   The distinction is based on a combination of relative liability to mobilization and training status.   The Ready Reserve consists of units and individual reservists with the highest training readiness, liable for involuntary active duty in time of war or national emergency.

The law further establishes within the Ready Reserve of each reserve component a Selected Reserve, consisting of units and individual reservists so designated by the secretary of the armed service concerned.   Selected reservists are members of the Armed Forces who regularly attend and are paid for inactive duty training and annual training.   Over 8000 Selected Reserve units drill throughout the United States and its territories.

The Army National Guard and Air National Guard together represent more than one-half the total strength of the Selected Reserve of all reserve components.   The two guard components have responsibilities both to the states and territories and to the federal government.   They may be called on by the governor of their state to maintain civil order and provide emergency relief.   Once they are mobilized, their control shifts to the President of the United States.

In contrast to the two guard components, the four service components exist solely to provide a wartime capability. Each of these components is organizationally subordinate to its corresponding armed service. The Coast Guard Reserve, which is part of the Department of Transportation, may be activated in peacetime or wartime to supplement the regular Coast Guard.

The primary wartime mission of the Selected Reserve components is to provide trained combat and combat-support units capable of meeting specific deployment schedules. These units are designated for use primarily in high-intensity conflicts lasting longer than a few weeks.[1] In such a conflict, certain Selected Reserve units would begin deploying within weeks, and all would deploy within the first year. The ability of the United States to sustain protracted high-intensity conflicts thus depends critically on the Selected Reserve. As of early 1982, the active force of 2 million is being reinforced by some 900,000 trained Selected Reserve personnel.

TRANSITION TO THE ALL-VOLUNTEER FORCE

Two aspects of the proposed All-Volunteer Force structure--the planned smaller size of the Active Force[2] and the diminished capability to rapidly mobilize and train civilians without an operating draft--had troubled defense mobilization planners. The total force policy solved the problem by expanding the reserve force mission in meeting defense mobilization requirements. The All-Volunteer Force thus must rely on the readiness of both active and reserve forces. Achieving that

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[1] Selected Reserve involvement in wartime is determined by the nature of the war and by political decisions. The more quickly a high-intensity war is decided, the smaller the reserve role will be. For conflicts of moderate or low intensity, involvement is partly a matter of political choice. During the Vietnam war, the decision was made to expand the size of the active force by draft, rather than by reserve mobilization. As a result, only a few reserve units were mobilized. During the Korean conflict, however, all reserve components contributed units and personnel. Reserve units have also been mobilized in peacetime, for example, during the Berlin crisis in 1961 and the Cuban missile crisis in 1962.

[2] The current active force of 2 million members is the smallest since 1949.

readiness includes meeting the mandated personnel strength levels in
both the active and reserve forces.[3]

Reserve force strength, however, which had been falling since 1970,
continued to decline in the AVF. By the end of FY 1978, the strength of
the Selected Reserve had dropped to about 788,000, down 15 percent from
1972, when the draft ended (see Table 1). Of the six Selected Reserve

Table 1

SELECTED RESERVE STRENGTH BY COMPONENT,[a] FY 1970-FY 1980

(In thousands)

Year	Army Natl Guard	Army Reserve	Naval Reserve	Marine Corps Reserve	Air Natl Guard	Air Force Reserve	Armed Forces Total
1970	409	261	128	49	90	50	987
1971	402	263	130	47	86	50	978
1972	388	235	124	41	89	48	925
1973	386	235	126	38	90	44	919
1974	403	235	115	31	94	46	925
1975	395	225	98	32	95	51	896
1976	362	195	97	30	91	48	823
1977	355	189	90	31	92	50	808
1978	341	186	83	33	92	54	788
1979	346	190	88	33	93	57	807
1980	367	206	87	35	96	59	850

SOURCE: *Official Guard and Reserve Manpower Strengths and
Statistics,* September 30, 1979.

[a]Excludes Coast Guard reserve data, because they are not
included in Department of Defense Selected Reserve data.

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[3] The required size of the Selected Reserve has long been debated.
Proponents of strength cuts feel that if later-deploying units not
considered essential to mobilization preparedness were eliminated,
overall size could be decreased without significantly weakening the U.S.
defense capability. This type of strength decrease must be contrasted
to one that leaves a significant number of units, both early- and
late-deploying, below strength. In the latter case, mobilization
readiness is severely impaired, because reservists, lacking geographical
mobility, cannot easily be shifted to train with and become members of
higher-priority units. Selected Reserve readiness critically depends on
maintaining the strength level of each unit.

components, only the Air National Guard and the Air Force Reserve had gained as part of the AVF. While the Navy's decline could be traced to uncertainty in mission requirements, the continuing decline in the Army and Marine components defied explanation. Like the active Army, these components depended on junior-level, draft-motivated personnel,[4] but while the active Army had met its mandated AVF strength levels, the reserve components had failed to reverse their losses. By 1978, the Army National Guard had fallen to 88 percent of its pre-AVF strength and the Army Selected Reserve to 79 percent. A review of the transition to the AVF will help to identify some of the causes of the decline in reserve strength.

The Gates Commission, appointed in 1970 to study the feasibility of an All-Volunteer Force, predicted that an active force of 2 million to 2.5 million could be sustained by raising entry pay levels somewhat above the minimum wage and maintaining the career force pay at inflation-adjusted levels.[5] These pay recommendations were based on studies showing that enlisting youth responded to increases in military wages and that reenlistees responded to an even greater extent. The elasticities[6] were estimated at 1.25 for enlistment and 2.8 for reenlistment.[7]

The research showing that active duty personnel responded to increased pay convinced Gates Commission members that the aggregate force size and specific skill shortages could be easily controlled in an AVF. The commission also predicted that reenlistment rates would rise even without a pay increase, because volunteer--as opposed to draft-motivated--enlistees would reenlist at higher rates.

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[4] Individuals holding low lottery numbers could choose reserve service rather than be drafted. Analysis of reserve accession during the draft shows that almost all had low lottery numbers and could be designated draft-motivated.

[5] The Report of the President's Commission on an All-Volunteer Force, U.S. Government Printing Office, Washington, D.C., 1970.

[6] An elasticity is the ratio of the percentage increase in enlistments to the percentage increase in compensation. An elasticity of 1.25 indicates that a pay rise of 10 percent would increase enlistments by 12.5 percent.

[7] Alan E. Fechter, "Army Enlistments," and Gary R. Nelson, "Army Reenlistment," in Studies Prepared for the President's Commission on an All-Volunteer Armed Force, U.S. Government Printing Office, Washington, D.C., November 1970.

Based on the Gates Commission report, the President and Congress in 1971 authorized the Department of Defense to implement the plan to end the draft in July 1973. In November 1971, the large junior-level pay increase recommended by the commission was instituted. In January 1972, an additional pay increase was given to both first-term and career personnel. At the same time, recruiting activities and advertising were increased, enlistment bonus payments were authorized, and enlistees were given guaranteed job and location choices. The increased level of active force enlistments resulting from these programs enabled DoD to end the draft in December 1972, 6 months ahead of schedule.

The maintenance of active force strength in the AVF at levels predicted by the Gates Commission may be attributed in large measure to the accurate estimates of pay effects. Subsequent studies[*] of active force enlistment and reenlistment have verified the importance of compensation in maintaining active force strength levels; the 1971 junior-level pay increase came close to achieving the desired enlistment response, and the reenlistment response is perhaps even more favorable than that originally assumed.

The Gates Commission report correctly predicted that the all-volunteer reserve would require special attention. The commission recognized a major problem in the reserve's heavy dependence on draft-motivated youth. Survey estimates made in 1968[9] showed that 75 percent of first-term reserve enlistees were draft-motivated, and, in fact, queues of individuals waited to enter the reserve rather than be drafted into the active force. These potential enlistees would disappear with the draft. The commission saw a second problem in the scarcity of research on the responsiveness of reservists to pay increases and in the poor quality of the data supporting such research.

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[*] For a review of enlistment studies, see Alan E. Fechter, "Review of the Literature: Some Methodological Issues," in Dorothy M. Amey et al., Econometric Models of Armed Forces Enlistment Levels, General Research Corporation, McLean, Virginia, October 1976. For a review of reenlistment studies, see Winston K. Chow and J. Michael Polich, Models of the First-Term Reenlistment Decision, The Rand Corporation, R-2468-MRAL, September 1980.

[9] The Report of the President's Commission on an All-Volunteer Force, U.S. Government Printing Office, Washington, D.C., 1970, Chapter 9, "Reserve."

In the absence of empirical estimates, commission members made several assumptions concerning reserve pay elasticities for both enlistment and reenlistment. While acknowledging that a key difference existed in labor markets from which individuals were recruited for the active and reserve forces (namely, the full-time vs secondary, or moonlighting, labor market), they nevertheless assumed that responsiveness to pay increases at enlistment would be almost as large in the reserve as in the active force. Thus, they estimated an enlistment elasticity with an upper bound of 1.25 (the active force enlistment elasticity) and a lower bound of 0.8.

Based on a 1968 survey of reserve personnel, the commission came up with the following reenlistment pay elasticities: for draft-motivated first-term members with 4 to 6 years of service, 2.0; volunteer first-term members with 4 to 6 years of service, 0.8; and members with 6 to 10 years of service, 0.3. These reenlistment elasticities were much lower than those estimated for the active force. The commission also found from the 1968 survey that, as might be expected, draft-motivated youth reenlisted at much lower rates than nondraft-motivated enlistees.

Anticipating a more favorable reenlistment rate in the AVF and the adoption of its recommended reserve pay increase, the Gates Commission predicted that a Selected Reserve force of between 900,000 and 1 million officers and enlisted personnel could be maintained. It also warned, however, that its estimates were inadequately based:

> Analysis of the Reserve problem, however, suffers seriously from a lack of data. Even though special care was taken to provide against error of estimation, the assessments of what is required to maintain an All-Volunteer Force are much more tenuous than for the active force.... Given the uncertainty which surrounds projections of Reserve enlistments and losses, further steps beyond the recommended pay increase may be necessary. Any further steps should await the results of experience with higher pay during the first few years.[10]

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[10] The commission did not actually recommend any separate reserve compensation initiatives. Reserve pay tables are linked to active force pay tables, resulting in equal percentage increases in basic pay for reserves when active force pay is increased.

THEORIES OF RESERVE PARTICIPATION

The decline in reserve strength during the early years of the AVF raised questions about the original Gates Commission assumptions. Since the assumed pay elasticities were based neither on behavioral data nor on a well-developed theory of reserve participation, it was natural to question their validity. Actual elasticities might be much lower than assumed, resulting in lower levels of accessions and reenlistments. Also, differences in reenlistment rates between volunteers and draft-motivated accessions might be smaller than expected, and first-term reenlistment rates might not have increased as much as expected.

As late as 1977, the lack of good data had prevented systematic empirical analysis of the reserve enlistment and reenlistment decision. In 1973, however, Rostker and Shishko[11] attempted to develop a theory of moonlighting, or secondary labor market participation, to explain the behavior of Air Force reservists. This theory portrayed the decision to moonlight as a trade-off between additional leisure time and income. The theory identified several important economic variables in a civilian moonlighting decision, including primary job hourly wages, primary job hours, and secondary job hourly wages. Empirical estimation on civilian moonlighting decisions confirmed the direction and importance of these variables. Moonlighting was less frequent among those having primary jobs with high hourly wages and longer hours. The most important finding for reserve compensation policy was that a 10 percent increase in secondary wages would result in a 9 percent increase in the probability of moonlighting. If civilian moonlighting decisions and reserve participation decisions are analogous, then reserve pay elasticities of around 1.0 would seem reasonable.

Participation in the reserve, however, has several unique features that make the analogy somewhat tenuous. First, the unusual work schedule for reservists calls for both monthly drilling and annual

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[11] Bernard Rostker and Robert Shishko, "The Economics of Multiple Job Holding," American Economic Review, Vol. 66/3, June 1976, adapted from their Air Reserve Personnel Study: Volume II. The Air Reserve Forces and the Economics of Secondary Labor Market Participation, The Rand Corporation, R-1254-PR, August 1973.

training. Drills require at least 16 hours per month, typically during a single weekend; annual training requires two full weeks during the summer. The two-week annual training period usually requires absence from civilian work. While employers are legally bound to provide military leave, evidence suggests that the requirement for annual training often creates conflict between the reservist and employer. Consequently, individual decisions to join the reserve cannot be considered independently of the type of primary job held and the attitude of the employer toward reserve participation.

Second, the amount of time that a reservist can work moonlighting averages only 4 hours per week, whereas the median for a civilian moonlighter is 13 hours.[12] Since average hourly civilian moonlighting pay and reserve pay are roughly equal, annual income from reserve participation is much lower than that from typical moonlighting jobs.

Third, reservists must legally commit themselves for up to 6 years of service, and they can be mobilized during periods of threat to the national security or, in the case of guardsmen, to assist in peacetime civil emergencies. While the term of commitment provides secondary job security, it may create conflicts when a change occurs in the individual's civilian job or family.

Fourth, reservists must have military training to qualify for reserve entrance or promotion. On entry, reservists must undergo at least 12 weeks of full-time training, and special training is often required for advancement. Certain types of military training are transferable to civilian jobs, and the acquired skills can enhance civilian employment opportunities. However, for reservists employed full time, training likely interrupts the primary job. For those who are unemployed, it provides temporary full-time employment, but interrupts their job search.

Fifth, reservists receive health, education, life insurance, tax, and pension benefits. For certain reservists, these benefits substantially boost reserve income. Reservists can, for instance, qualify for a pension after 20 years of satisfactory service. Although

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[12] Multiple Jobholders in May 1978, Special Labor Force Report 221, U.S. Department of Labor, Bureau of Labor Statistics.

the pension is payable at the age of 60, calculations show that the equivalent of 50 percent of each reservist's pay would have to be set aside were the reserve pension system funded on an actuarially sound basis.[13]

Finally, the reserve job offers certain nonpecuniary rewards. The work itself often offers opportunities for training and the use of unique equipment. The social environment seems to create a sense of camaraderie and cohesion. These rewards may play an important role in reserve participation and lead to a model of participation much closer to that of a fraternal association than that of a secondary job. In this view, reserve participation primarily satisfies leisure or avocational needs, and the income potential is secondary. If these needs are the prime reason for participation, one would expect small pay elasticities.

Because of the unique nature of the reserve job, it was difficult even to guess the supply response to a pay increase. No empirical estimates of enlistment or reenlistment supply elasticities for reservists had been published up to 1977. That year, an evaluation of the research possibilities revealed that it would be difficult to estimate supply response using traditional time series or cross-sectional methods. Not only were reserve data poor, but data for certain key variables, including secondary wage levels, were not readily available.

Isolating the causes of the declining strength of the reserve AVF and formulating reserve pay and personnel policies required developing a more complex theory of reserve manpower supply and designing and collecting data to test an empirical model of reserve participation. Recognizing that an adequate model did not exist and that data were poor, the Department of Defense requested funds from Congress to test several reserve pay and benefit initiatives. The first reserve pay incentive authorized by Congress was a reenlistment bonus.

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[13] Richard V. L. Cooper, unpublished research on "Accrual Accounting for Reserve Retirement," The Rand Corporation, January 1978.

II. DESIGN AND IMPLEMENTATION OF THE 1978 SELECTED RESERVE REENLISTMENT BONUS TEST

FUNDING AND ORGANIZATION

In mid-1977, the Department of Defense requested funds from Congress to test the effectiveness of several monetary incentives in the two Army Reserve components. Funds were sought for enlistment and reenlistment bonuses and educational benefits. Congress authorized a reenlistment bonus and educational assistance in fall 1977, but appropriated funds only for a reenlistment bonus test in FY 1978.[1] The legislation authorizing that test resulted from a merger of an existing legislative program request from the U.S. Army Reserve (USAR) and Army National Guard (ARNG) and the DoD request to test incentives. The Office of the Secretary of Defense (OSD) had wanted broad authority to design and test a range of incentives in the reserve forces. The ARNG and USAR had sought a nationwide bonus program, rather than a test, but Congress authorized OSD to test only the bonus plan contained in the ARNG- and USAR-sponsored legislation. The result was a narrow test of a specific program, rather than a broad retention experiment. The FY 1978 Appropriation Act, passed by a conference committee on September 21, 1977, authorized a test beginning October 1, 1977, and extending only through September 30, 1978.

The appropriation provided funds only for the Army Selected Reserve components, with $2 million allocated to the Army Reserve and $3 million to the Army National Guard. The authorization specified the amount, form, and timing of bonus payments, and eligibility and reporting requirements. The bonuses amounted to $900 for a 3-year reenlistment and $1800 for a 6-year reenlistment, one-half ($450 or $900) to be paid at the time of reenlistment and the remaining amount in installments of $150 at the completion of each obligated year of service. Reservists who failed to complete their reenlistment contracts

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[1] In FY 1979, it authorized enlistment bonus payments and educational incentives.

were obligated to repay part of the bonus, depending on the time already served. Reservists extending their commitment for less than 3 years were not eligible to receive the bonus.[2]

The authorization specified two eligibility requirements. Only reservists with less than 10 years of service and only those who had entered the reserves without prior military service were eligible for bonus payments. Reservists who had served in the active force prior to joining the reserve were not eligible. Finally, the authorization called for quarterly reports to Congress on the number of individuals receiving bonus payments.

Because this was the first military compensation test authorized by Congress,[3] the Department of Defense lacked a precedent for its design, administration, and evaluation. In particular, the roles of OSD and the reserve components needed definition. Responsibility for the test was assigned to the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics)--OASD (MRA&L), who decided to retain control of the design, monitoring, and evaluation and to draft guidelines for administration by the National Guard and Army Reserve. Within OASD (MRA&L), authority for conducting the test was delegated to the Reserve Compensation System Study (RCSS), a group established to review reserve compensation policy. At that time, the Manpower, Mobilization, and Readiness Program of The Rand Corporation, under contract to OASD (MRA&L), had initiated a project to study Selected Reserve strength problems. RCSS asked Rand to participate in the design, monitoring, and evaluation of the test.

OBJECTIVES OF THE TEST DESIGN

In authorizing the 1978 bonus test, Congress wanted to find out whether a bonus would increase reservist retention rates and terms of

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[2] In this report, "reenlistment" will refer only to a 3-year or 6-year commitment and "extension" to a 1-year or 2-year commitment.

[3] An earlier experiment in the Army and Air National Guard tested the effect of shorter tours of duty. See Gus W. Haggstrom, The Variable Tour Experiment in the Army Reserve Components, The Rand Corporation, R-1568-ARPA, May 1975. The potential for experimentation in the military was described by Haggstrom in The Pitfalls of Manpower Experimentation, The Rand Corporation, P-5449, April 1975.

commitment. Before the test, most reservists simply extended their reserve commitment for one year at a time. Because the bonus was to be offered only to those who accepted 3-year or 6-year reenlistment terms, the effect on both retention and terms of commitment could be measured.

This narrowly restricted test could not, however, measure the effect of pay raises on reserve participation. While the bonus represented a sizable increase in reserve compensation,[*] it differed from a pay increase in its limitation and timing. First, because it was coupled with a longer commitment, not all retained reservists would receive additional pay. Second, bonus payments, unlike a simple increase, would not show up in reservists' regular pay and would last for only 3 or 6 years. Thus, simple pay elasticities could not be derived from the test.

During the design of the test, the scope was broadened to include the development of a model of the reserve reenlistment decision from which a reserve pay elasticity could be derived. The magnitude of the pay elasticity derived from the model would allow tests of the hypothesis that low reserve strength was caused in part by a low pay elasticity. This model could also include variables predicted by moonlighting labor theory to be important and would thus test the applicability of this theory to reserve participation. Data to develop a model could be gathered through a survey administered during the test.

Survey data could also be used to test a second hypothesis: whether low reserve strength represented a transitory phenomenon caused by the continuing presence of draft-motivated personnel. If such reservists had significantly lower first-term retention rates, then high loss rates would continue until they finished their term of service. The initial

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[*] The actual percentage gain in compensation for those who accepted a bonus depended not only on pay grade and years of service, but also on assumptions made concerning inflation, discount rates, and annual training pay. Annual training pay can substitute for civilian income, in which case it represents no gain in net income, or it can increase income if both reserve and civilian income are received during annual training. Depending on the assumptions made, the percentage increase in bonus pay ranges from 20 to 40 percent. See A Model of Reenlistment Decisions of Army National Guardsmen, R-2866-MRAL, forthcoming, for a more detailed treatment of reserve income.

term is 6 years and the last draft year was 1972; therefore, high loss rates could be expected to continue through 1978 and to reverse in 1979. Since the test took place in 1978, the test sample would contain both draft-motivated and other reserve personnel,[5] and differences in retention rates could be measured.

The expanded objectives of the test were, then,

- To test the effect of the reenlistment bonus on retention rate and term of commitment.
- To develop a model of reserve retention and thereby test the applicability of moonlighting labor theory to reserve participation.
- To test two hypotheses concerning the cause of low reserve strength: an inelastic pay response and an inflated loss rate because of the continuing presence in the reserve of draft-motivated personnel through 1978.

This report discusses the effect of the bonus and the reenlistment behavior of draft-motivated personnel. _A Model of Reenlistment Decisions of Army National Guardsmen_, R-2866-MRAL, forthcoming, describes the reserve retention model and addresses the question of pay elasticity.

EXPERIMENTAL DESIGN CONSIDERATIONS

Designing an experiment requires balancing statistical considerations to ensure accuracy and validity against administrative considerations to ensure feasibility, data reliability, and efficiency. From a statistical viewpoint, an experiment that randomly assigned reservists--regardless of location or unit affiliation--to either a bonus group or control (nonbonus) group would be ideal. The

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[5] Draft-motivated individuals could be identified on the basis of birth dates from surveys or personnel records to determine Selective Service lottery numbers. Draft eligibility was assigned by lottery numbers from 1 to 365, based on random allotment of birth dates. Draft calls began with the lowest numbers and proceeded until quotas were met. Persons holding low lottery numbers would have been subject to draft pressure; those holding high numbers would not.

appropriated money would be sufficient to cover bonus payments for 3000 to 5000 reenlisting reservists. A design based on such a sample would allow an accurate measurement of the bonus effect. Strictly random selection, however, would result in (1) wide geographic dispersion, complicating administrative efficiency and data reliability, and (2) individual pay differences within the same unit, threatening the validity of the test by affecting the independence of reenlistment decisions.

A sample design specifying bonus and control groups by geographic areas would clearly facilitate administration and increase the validity by preventing interactions among those receiving and those not receiving bonuses. Clustering at the unit level would have been ideal, since enough units could be included to ensure statistical accuracy through randomization. However, the geographic areas had to be states, and budgetary constraints limited the number of states that could be included, to the point that random selection alone would not guarantee desired statistical criteria. Under these circumstances, preexperimental matching of bonus and control regions, rather than a purely random design, strengthened the validity of the test results. The preexperimental matching of bonus and control areas in designing the experiment was complicated, however, by the data constraints imposed by the limited design time.

CONSTRAINTS ON BONUS TEST DESIGN

Because of the extremely short time available for test design and the development of administration procedures, the design and site were selected on the basis of limited data. Part of the design time was spent reconciling the inevitable conflicts engendered by the differing objectives of test designers and the reserve organizations. The reserve organizations had requested and expected a nationwide bonus program to address immediate strength problems. Even after the test legislation passed, the ARNG and the USAR wanted a test that would compare reenlistment rates during a nationwide implementation with those of a previous year. This type of test would have allowed the reserve to target low-strength units and would have required minimal DoD

participation. On the other hand, Rand and DoD sought an experimental or quasi-experimental design that would limit bonus payments to a few regions. These conflicting objectives led DoD to retain control of the test design, monitoring, and evaluation.

The reserve organizations, however, were responsible for actual test administration. The test design, therefore, had to take account of the various constraints imposed by the structure and objectives of the reserve component. The differing ARNG and USAR organizational constraints were based on differences in structure, geographic boundaries, and data systems.

The ARNG organizational contraints arose primarily from the guard's dual state and federal responsibilities. The Army National Guard consists of 53 separate state and territorial organizations.[6] In peacetime, relatively autonomous State Guard bureaus retain control over personnel policies and programs within their territory. The National Guard Bureau (NGB) in the Pentagon coordinates, but has no direct authority over, State Guard bureaus in peacetime.[7] Because of this structure, state approval was needed to conduct the test. States were unlikely to approve designs that would lead to nonuniform bonus policies within the state.[8]

The state thus became the level at which bonus or control assignments were made. Each bonus state was prematched to a control state, based on selected available characteristics. Data were readily available at the state level describing the state's economy and demography and the guardsmen's characteristics.

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[6] One for each state and Puerto Rico, the District of Columbia, and the Virgin Islands.

[7] A complex set of laws and regulations define the authority of the State Guard bureaus and the National Guard Bureau. In peacetime, the NGB serves as a channel of communication between State Guard bureaus and the Departments of the Army and Air Force, and formulates and administers programs to ensure continued nationwide development and maintenance of Army and Air Guard units.

[8] Of the 14 states eventually chosen to participate in the test, West Virginia declined because the eligibility requirements specifically excluded from bonus eligibility reservists with prior military service.

The Army Reserve constraints   the test design were more
stringent than those of the Army National Guard. The Army Reserve is
organized into large administrative regions called Army Reserve Commands
(ARCOMs), and it too was unwilling to allow different bonus treatments
within an ARCOM. The small number of ARCOMs (19) restricted the proper
matching of test and control regions. Furthermore, ARCOM boundaries
do not necessarily correspond to state boundaries; thus, the data
describing economic and population characteristics of test regions for
the National Guard were not readily available for the Army Reserve. Nor
were Army Reserve personnel data as readily available.

The components differed also in the amount of control each exerted
over the design. After agreeing to selection criteria, the National
Guard completely relinquished control of site selection to Rand. The
USAR, on the other hand, actively participated in the specific choices
of bonus and control areas. These organizational differences resulted
in an easier, and more defensible, selection of bonus and control groups
in the National Guard than in the Army Reserve. The primary effect of
all of these organizational constraints, however, was to preclude a
meaningful random assignment to treatment groups. Thus, the final
design is characterized as quasi-experimental rather than experimental.

DETERMINATION OF ELIGIBILITY REQUIREMENTS

Two eligibility requirements needed further specification before
test design could proceed. The first eligibility criterion was years of
service (YOS). Congress specified that a reservist must have less than
10 years of service. OSD (MRA&L) set the eligibility criterion at less
than 8 years of service for two reasons. First, retention rates were
much higher for reservists with 8 to 10 years of service than for those
with less than 8, and the continuation rate after 10 years of service
was 85 percent. This higher rate was due partially to the pull of
reserve retirement pay. Since retention rates are already so high,
retention incentives may be less effective for the groups with longer
service. Second, reducing the number of eligible reservists in each
area would allow more regions to participate and lead to a more
representative national sample.

A second eligibility criterion was the definition of a "window," or reenlistment decision point. Only reservists whose term of service expired between January 1 and December 31, 1978, were declared eligible. The earlier date coincided with the start of the test period.[9] The test was to be conducted for a full year so that seasonal variations in reenlistment behavior would not affect the results. However, the authority to obligate bonus money lasted only until September 30, 1978, the end of the fiscal year. To solve this problem, eligible reservists were allowed to reenlist 3 months before the expiration of their term of service.

The final eligibility requirements for test participation were the following:

- Original entry into military service through the reserve, that is, no prior military service.
- Less than 8 years of service when term of service ends, and an ETS between January 1 and December 31, 1978.
- Satisfactory participation in a unit of the Army National Guard or Army Reserve as of October 1, 1977.

Once the state and ARCOM had been designated the level of aggregation and the eligibility requirements specified, the test could be designed and fielded. The design of the test included the selection of bonus and control sites, development of test administration procedures, and specification and design of supplementary data collection. These are described below.

SELECTION OF GUARD AND RESERVE BONUS TEST REGIONS

The first step in selecting bonus and control regions[10] involved determining the sample size so that the projected bonus expenditures

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[9] OSD (MRA&L) persuaded Congress to allow the test to begin January 1, 1978, instead of October 1, 1977, to allow for test design and implementation.

[10] "Bonus regions" will henceforth refer to areas where bonus payments were offered. "Control regions" are the matching regions where bonus payments were not offered. The terms "test region" and "test population" include individuals in both bonus and control regions.

would not exceed authorized amounts. Congress had allocated $3 million to the National Guard and $2 million to the Army Reserve for the test.[11] On this basis, the test designers set the size of the sample of reservists who would be offered a bonus at 5400 for the National Guard and 2700 for the Army Reserve, assuming equal size for the control groups. Of the total test sample of approximately 16,200, 10,800 would be National Guardsmen and 5400 Army reservists.

Two choices were possible for the control regions: the entire country outside of test regions or a smaller subset of states and regions. The latter was selected to minimize the administrative burden on the reserve organizations and Rand arising from the collection of ancillary data (surveys, military personnel records, and monthly reports). Bonus and control regions were chosen in matched pairs. The actual selection process differed for the National Guard and Army Reserve.

National Guard Site Selection

The National Guard Bureau agreed to procedures proposed by Rand for the selection of bonus and control states. These procedures specified the following criteria:

- The total number of eligible individuals in the selected bonus states was to be such that the estimated expenditures for bonus payments would not exceed $3 million.
- Only states that had less than 100 percent of authorized strength as of May 31, 1977, were eligible for selection.[12]
- A state was eligible only if it could be matched to a similar control state in t : same region of the country.
- Only states that agreed to initiate no other major programs affecting reenlistments during the test period were eligible.

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[11] The calculation of a sample size within this budgetary limitation and the assumptions underlying these calculations are detailed in Appendix A.

[12] This criterion eliminated only Florida and Missouri. It was included to eliminate possible demand constraints on reenlistment rates in states at 100 percent of authorized strength.

- Only states that could handle the administrative requirements of the test were eligible.
- The states chosen were to be representative of the United States in terms of per capita income, historical reenlistment rates, and unemployment rates.
- The test was to include states from each region of the United States.

The matching process primarily paired states with similar historical retention rates for the eligible population; however, only aggregate retention rates for each state guard population were available. The bonus-eligible population constituted approximately 40 percent of the total number of annual reenlistees. The population for these aggregate statistics differed in two ways from the bonus-eligible population. First, the eligible population consisted of personnel with less than 8 years of service, whereas the aggregate retention rate included all years of service. Second, the eligible population consisted only of reserve personnel with no prior service, whereas the aggregate retention rate also contained personnel with prior service.

Because the available data did not match the desired retention rate, preexperimental matching was based on both retention rates and a secondary set of characteristics. A preliminary regression analysis showed both state per capita income and state unemployment rates (obtained from Bureau of Labor Statistics) to be related to the aggregate retention rate. These variables were therefore included in the matching process. In addition, four other variables--guard personnel strength, guard strength as a percentage of authorized strength, state population, and percentage of the state population in urban areas--were included to control for possible demand difference by region and to match recruiting potential for new reservists.

For each state, a set of matching states was generated and ranked by the technique of sequential searches. For two states to meet the matching requirements, each pair of characteristics of the two states had to fall within the preassigned range of tolerance. The lowest tolerances were assigned to reenlistment rate, per capita income,

unemployment, and percentage of authorized strength. This process generated ranked lists of matching states. From this list, the final set of state pairs (see Table 2) was chosen to achieve national representativeness and the best match of characteristics and to meet budget constraints.

Seven pairs of states were chosen, and a random draw determined which state of the pair was the bonus state and which was the control. The process resulted in strong comparability on the four primary

Table 2

CHARACTERISTICS OF NATIONAL GUARD BONUS AND CONTROL STATES

	Retention Rate (%)	Per Capita Income	% Unem- ployed	% of Authorized Strength	% Urban	Guard Strength	State Population (000)
Kansas(a)	61	$6495	3.5	75.9	43.2	5,533	307
Iowa	60	6439	3.0	78.7	36.9	6,148	355
New Jersey	52	7269	9.5	84.9	92.8	11,627	853
New York	54	7100	9.0	82.4	88.4	17,821	2175
Michigan	51	6994	7.5	94.5	81.3	8,356	1260
Pennsylvania	58	6466	6.9	80.6	80.7	13,983	1430
Georgia	59	5571	6.3	97.7	56.7	9,691	672
North Carolina	60	5409	5.4	94.4	45.0	11,024	764
North Dakota	72	5400	4.3	93.4	12.6	2,362	86
Idaho	66	5726	5.8	93.9	16.5	2,612	110
Oregon	59	6331	8.9	84.1	60.0	5,507	295
Washington	62	6772	7.5	83.8	71.8	4,858	485
West Virginia(b)	73	5394	7.0	90.2	36.6	3,130	209
South Carolina	70	5126	5.2	89.7	48.2	9,580	411
Average							
Bonus states	61.0	6208	6.7	87.2	54.7	6,601	526
Control states	61.4	6148	6.1	86.2	55.4	9,432	819
Bonus and control states	61.2	6178	6.4	86.7	55.0	8,016	672
Fifty states	60.5	6247	6.3	87.9	58.4	6,938	550
Standard deviation	8.7	993	2.1	7.6	26.3	4,543	580

(a) The bonus state is listed before the control state in each pair.
(b) West Virginia withdrew before the test began. Administrative and survey data collected from South Carolina were not used in the analyses of the bonus test.

matching variables between bonus and control states. The bonus and control states also appear representative of the nation.

Army Reserve Site Selection

Major problems complicated the choice of sites for the Army Reserve. To begin with, the boundaries of the ARCOMs, the administrative regions designated for the test, did not correspond to state boundaries, and the Bureau of Labor Statistics could not provide data on income, unemployment, and percentage of the population in urban areas by ARCOM. In their calculations for purposes of matching statistics, the test designers therefore had to consider states split by ARCOM boundaries to be entirely within the ARCOM. Furthermore, reenlistment data were not available by ARCOM. Finally, the Army Reserve arbitrarily eliminated certain regions from consideration. Regions were therefore selected on the basis of four estimated factors: population, income, unemployment, and percentage of the state population living in urban areas. Table 3 shows the two pairs of regions selected. In addition to these regions, the Army Reserve decided to test the bonus in an infantry brigade in the midwest. This test brigade and another in the northeast were matched against a control infantry brigade in the northeast.

ADMINISTRATION OF THE 1978 BONUS TEST

Data Sources

The data sources used to administer, monitor, and evaluate the bonus test are described briefly below and in more detail in Appendix B.

Initial Eligibility Rosters (IER). Before the test was initiated, each component in both bonus and control areas listed, by unit, each individual who met the eligibility criteria. The official test roster compiled from these lists was used to monitor the experiment. The U.S. Army Finance and Accounting Center used the roster to verify eligibility when requests for bonus payments were received. In estimating overall test costs, the test designers used the roster as an indicator of the size of the bonus-eligible population in the bonus

Table 3

CHARACTERISTICS OF ARMY RESERVE BONUS AND CONTROL REGIONS

	State Population (000)	Per Capita Income	% Unemployed	% Urban
Bonus Region: 94th ARCOM and 76th Training Division				
Connecticut	388	$7373	7.9	88.5
Maine	132	5385	9.2	23.3
Massachusetts	771	6585	6.5	86.2
New Hampshire	101	5973	7.9	35.8
Rhode Island	112	6498	7.1	93.2
Vermont	61	5480	8.1	--
Average	261	6216	6.7	65.4
Control Region: 79th and 99th ARCOMs				
Pennsylvania	1430	6466	6.9	80.7
Ohio	1417	6432	6.2	79.7
West Virginia	209	5394	7.0	36.6
Average	1019	6097	6.7	65.7
Bonus Region: 96th ARCOM				
Colorado	380	6503	6.2	80.9
Idaho	110	5726	5.8	16.5
Montana	98	5600	4.2	24.2
Utah	190	5482	4.7	78.7
Wyoming	53	6723	3.7	--
New Mexico	166	5213	8.2	23.6
Average	166	5874	5.5	38.2
Control Region: 89th ARCOM				
Kansas	307	6495	3.5	43.2
North Dakota	86	5400	4.3	12.6
Nebraska	204	6240	2.3	40.2
South Dakota	91	4796	3.1	14.6
Average	172	5732	3.3	27.7
Average				
Bonus regions	213	6045	6.1	51.8
Control regions	534	5889	4.8	43.9
Bonus and control regions	331	5988	5.6	48.9
Fifty states	550	6247	6.3	...4

areas. Rand used the roster, aggregated to the unit level, as a distribution list for the survey questionnaires described below.

Requesting IER information prior to the allocation of specific states or ARCOMs to either a bonus or a control group protected the integrity of the evaluation. If a unit did not know whether or not its eligible members would be offered bonus payments, the probability of its returning complete and timely information was higher.

Reserve Personnel Master Files (RPMF). Rand also requested the RPMF records of bonus-eligible individuals, because the RPMF contain more extensive individual data that could be used in evaluating the bonus test. Race, education, and marital status were hypothesized as possible explanatory variables for the reenlistment decision, and the RPMF were the most complete source of such information. Also, the RPMF were used to verify the bonus eligibility of the reservists on the test roster.

Monthly Status Reports. By the 15th of each month, each bonus and control unit participating in the test submitted a report on the reenlistment decision of each bonus-eligible individual whose term of service had expired in the preceding month; e.g., for individuals with ETS dates in March, a report was due by April 15. These reports listed individuals who either separated or reenlisted and, for those who reenlisted, the length of the term selected.

These monthly reports enabled Rand to provide OSD (MRA&L) with timely information about reenlistments and to monitor the information-gathering process closely. OSD used the monthly summaries in preparing quarterly reports for Congress. By periodically comparing the names on the monthly status reports with those on the roster, Rand was able to identify reporting lags for whole units, as well as for specific individuals for whom a reenlistment decision was missing, and to request additional information.

Survey Questionnaires. Data to analyze the process by which individuals decided whether or not to reenlist were collected by means of a self-administered questionnaire. The questionnaire was distributed to all bonus-eligibles in both bonus and control regions as part of the processing related to reenlistment or separation. The questionnaire

collected five types of information: military experience, demographic background, family resources, labor-force experience, and factors related to the reenlistment or separation decision.

Determination of Bonus Test Population

The rapid implementation of the 1978 bonus test precluded detailed decisions about the appropriate population to be used in the final evaluation. Congress determined the criteria for eligibility and the components identified individuals who met these criteria in both bonus and control areas. Nevertheless, it was inevitable that further checking would identify some individuals who had been omitted and some who had been included erroneously. In addition, in the course of the analysis, decisions were made about inclusion and exclusion of individuals with specific characteristics. The distinction between the administrative and analytic populations used in this report is summarized below and described in detail in Appendix B.

The administrative population for the bonus test consisted of all individuals, in both bonus and control areas, who had ever been considered eligible for the bonus. This definition included both individuals whose eligibility was verified and those who were found to be ineligible. Rand monitored the experiment and collected the reenlistment information by creating and continuously updating an administrative file. This file was created by linking the IER information to the RPMF by means of individual Social Security numbers. The file contained a record for every member of the administrative population.

Bonus test eligibility was verified by the presence of a 1978 end of term of service (ETS) and a calculation of less than 8 years of service based on ETS and pay entry base date (PEBD). If discrepancies were not resolved with the component, the individual was considered ineligible for analytic purposes. Individuals who were identified as bonus-eligible after the start of the experiment were added to this file. Individuals identified as not meeting the eligibility requirements by the components were also flagged as ineligible. As monthly status reports were submitted, the reenlistment decision was added to the file and summary reports generated.

The analyses described in this report were based on information on approximately 15,300 members of the Army National Guard and United States Army Reserve. These individuals were selected from the administrative population because they met a set of analytic criteria established to ensure that the analytic population would in no way be biased.

The analyses included only individuals identified as members of the bonus and control areas either before the bonus test began or in a major review of participants in early 1978. Rand excluded individuals for whom a 1978 ETS and less than 8 years of service could not be verified, those who were added to bonus areas in the last months of the program, those who were identified by the ARNG or USAR as ineligible to participate for administrative reasons (e.g., attendance), and those who were allowed to receive a bonus under special circumstances. By the end of the bonus test, the administrative population totaled 17,083. The exclusion of individuals for analytic and data-related reasons produced an analytic population of 15,315, including 11,294 in the ARNG and 4,021 in the USAR. Table 4 shows the distribution of individuals by component and, within component, by bonus and control areas.

Table 4

DISTRIBUTION OF ANALYTIC POPULATION IN BONUS
AND CONTROL AREAS, BY COMPONENT (a)

Bonus Area	No. of Participants	Control Area	No. of Participants
United States Army National Guard			
Kansas	641	Iowa	835
New Jersey	1081	New York	1660
Michigan	972	Pennsylvania	1733
Georgia	732	North Carolina	1084
North Dakota	277	Idaho	297
Oregon	639	Washington	432
West Virginia(b)	0	South Carolina	911
Total	4342	Total	6952

Bonus Area	No. of Participants	Control Area	No. of Participants
United States Army Reserve			
94th ARCOM(c) and 76th Training Division(c) Connecticut Maine Massachusetts New Hampshire Rhode Island Vermont	845	79th ARCOM(c) and 99th ARCOM(c) Pennsylvania Ohio West Virginia	1748
96th ARCOM(d) Colorado Idaho Montana New Mexico Utah Wyoming	478	89th ARCOM(d) Kansas North Dakota Nebraska South Dakota	437
205 Infantry Brigade(e) Iowa Minnesota Wisconsin	177	157 Infantry Brigade(c) Pennsylvania	213
187 Infantry Brigade(c) Massachusetts	121		
Total	1621	Total	2398

(a) The analytic population is described in Appendix B.
(b) West Virginia withdrew before the test began.
(c) Part of the First Army.
(d) Part of the Sixth Army.
(e) Part of the Fifth Army.

III. EVALUATION METHODOLOGY

APPROACH

The offer of a bonus may affect two decisions that a reservist faces: whether or not to reenlist, and if he reenlists, the term of commitment; it may also affect his actual years of service. To evaluate the full effect of a bonus, each of these decisions must be studied.

Without a bonus offer, most reservists, if they reenlist, extend their term for only one year. To qualify for a bonus, however, the reenlisting reservist may be willing to commit himself to a 3- or 6-year term of service. Furthermore, independent of the effect on the term of commitment, a bonus offer may influence the timing of a future separation decision. If all reservists fulfilled their term of commitment and then left the reserve, the initial term of commitment would indicate the actual expected years of service. However, some commitments are broken, and many reservists also reenlist for another term. The evaluation of the bonus must therefore include actual years served. This report follows up test participants two years after the beginning of the 1978 bonus experiment. A complete evaluation of years served, however, will require future longitudinal tracking of test participants.

The analysis of each of the three decisions must account for a possible preexperimental nonequivalence of bonus and control groups. We corrected for two possible sources of imbalance: individual and regional differences. Besides demographic characteristics, individual differences used in the analysis included variables describing current and previous military experience. Regional characteristics included per capita income and the unemployment rate.

In addition to measuring the bonus effect, the models developed analyze the effect of demographic and regional characteristics on reenlistment behavior. The models therefore can be used to predict reenlistment rates either as the demographic composition (e.g., the proportion of women) of the reserve force changes or as regional economic conditions (e.g., the unemployment rate) change. The dependent

and independent variables included in the analyses and the form of the models developed are described below.

VARIABLES

The analyses included three types of dependent variables—reenlistment decision, term of commitment, and presence in the reserve one year after the test ended—and four types of independent variables—experimental variables, demographic variables, military experience, and regional characteristics.

Dependent Variables

Reenlistment, Term of Commitment. The reservist had the option at the end of his term to separate, extend for 1 or 2 years, or reenlist for 3 or 6 years. We modeled the reserve decision as four sequential decisions:[1]

1. To separate from the reserve or to continue to participate.
2. To extend (1 or 2 years) or to reenlist (3 or 6 years).
3. To reenlist for 3 years ($900 bonus) or 6 years ($1800 bonus).
4. To choose when ultimately to separate from the reserve.

Viewing these decisions as a series of binary choice models, we defined four dichotomous dependent variables. The first variable (REUP) indicated the reservist's first decision: to separate or to extend or reenlist. The second variable (REUP36) indicated the second decision: to extend (1 or 2 years) or to reenlist (3 or 6 years). The

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[1] Another approach to modeling the retention and term decision is to use a multinominal logit formulation. See D. McFadden, "Conditional Logit Analysis of Qualitative Choice Behavior," in P. Zarembka (ed.), Frontiers in Econometrics, Academic Press, New York, 1973. We modeled the decision as a series of sequential binary decisions, however, because this formulation more closely conforms to the policy objectives (increasing retention rates and commitments), and evidence suggests that people actually make these types of decisions through a sequential, binary process rather than comparison of alternatives as single entities. See D. Gensch and J. Svestka, "An Exact Hierarchical Algorithm for Determining Aggregate Statistics from Individual Choice Data," Management Science, Vol. 25, No. 10, October 1977.

third variable (REUP6) indicated the third decision: to reenlist for a 3-year term or for a 6-year term. The fourth dependent variable (FOLLUP) indicated whether the reservist separated or remained in the reserve 2 years after the start of the experiment.

The analyses were performed only on the populations making the choices indicated by the dependent variable (see Table 5). For example, since REUP36 indicates the decision to extend or reenlist, the analyses with REUP36 included only those who extended or reenlisted; those who separated were omitted from the analyses.

Follow-up Membership. To assess the effects of the bonus on actual, rather than merely committed, man-years of service, we analyzed data on reserve participation through the end of 1979. Because bonus eligibility was limited to individuals whose term of service ended between January 1 and December 31, 1978, the average follow-up period was 1-1/2 years beyond the reservist's reenlistment decision. Records were obtained from the Reserve Components Common Personnel Data System

Table 5

DEPENDENT VARIABLE AND POPULATION IN FOUR MODELS
OF REENLISTMENT

	Dependent Variable			
	REUP	REUP36	REUP6	FOLLUP
Years of commitment	0 vs 1,2,3, or 6	1 or 2 vs 3 or 6	3 vs 6	0 (separated) vs 1 (remained)
Population	Separators Extenders Reenlistees	Extenders Reenlistees	Reenlistees	Separators Extenders Reenlistees
Number	14,221	5,586	2,311	14,221

as of December 31, 1979. Since all reservists were followed for more than 1 year, individuals who chose a 1-year extension during the bonus test had made a second reserve participation decision before the follow-up data were collected.

A dependent variable was derived based on information in the follow-up records. Individuals were classified as members or nonmembers as of December 1979. Because not all individuals could be unambiguously classified as members or nonmembers, two categories were created for the ambiguous records: unknown and possible loss. The estimate of membership depends on the assumptions made concerning individuals in these two categories. Three follow-up variables were actually defined, each with different assumptions, to describe participation after one year. The first variable assumed that the unknowns and possible losses, in fact, separated from the reserve prior to the end of 1979. The second assumed that they were members at the end of 1979. The third variable simply excluded both unknowns and possible losses from the analyses. A discussion of these classifications, by treatment group and reenlistment decision during the bonus test, is presented in Appendix D.

Independent Variables

Experimental Variable. The first independent variable is the experimental, or treatment, variable. There were only two treatment groups, bonus and control, described by a single dichotomous variable representing the presence or absence of a bonus offer.

Demographic Variables. The second set of independent variables were demographic variables. The variables present in the personnel files were sex, race, education, marital status, number of dependents, and year of birth (age). Because of differing economic status and opportunities, as well as taste for reserve service, we expected reenlistment decisions to depend on these variables.

Military Experience Variables. The third set of independent variables, describing military experience, included component, military occupational specialty (MOS), pay grade, term of service, length of first term, and entrance motivation.

The two components, the National Guard and the Army Reserve, have different missions and therefore offer somewhat different job and promotional opportunities, as well as a different organizational climate. We therefore expected reenlistment behavior to vary systematically by component. The type of job for which the reservist has trained may also influence the reenlistment decision. Job characteristics that may affect the reenlistment decision include civilian transferability, wartime and peacetime job risks, and training environment. Lacking measures of these characteristics, we used a simple combat vs. noncombat dichotomous variable based on MOS.

The first-term retention rate is much lower than that for subsequent selection, in part because of the pull of eligibility for the reserve retirement system after 20 years of service. A dichotomous variable indicated whether an individual was at the first or a subsequent decision point.

The length of first term may reveal a preference for reserve participation, with those choosing initial 6-year terms showing greater preference for the reserves than those choosing initial 3-year terms.[2] A dichotomous variable indicating either a 3- or 6-year term was defined.

Pay grade reflects the difference in earnings from reserve participation, as well as career advancement and possible status within the reserve.

A variable that described the population participating in this experiment, but not reservists entering today, is draft motivation. A variable was created to identify those who enlisted in their current term to avoid the draft. The derivation of this variable, based on birth dates and lottery numbers, is described in Appendix E.

The final military experience variable in this analysis is the interaction between the term and sex of the reservist. Initial cross tabulations of the data indicated that first-term males reenlisted at a lower rate than career males but that first-term females reenlisted at the same rate as career females. As the motivations driving these

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[2] Currently, only women can choose 3-year terms. In the mid-1970s, however, the Selected Reserve also had a special program for males over the age of 25 for first-term enlistments of only 3 years, with the balance obligation in the Individual Ready Reserve.

first-term men to enlist is unknown, a separate variable identifying this population was included.

Regional Characteristics. Two regional characteristics, the unemployment rate and the logarithm of per capita income, were used to describe the state or ARCOM in which the reservist lived. Both have been shown to be significant in explaining the reserve retention rate.

The variables were coded as shown in Table 6. (See Appendix F for detailed definitions and assumptions and Appendix G for a comparison of National Guard and Army Reserve samples.)

Estimation Method and Treatment of Missing Data

The dependent variable in each model is dichotomous. The logistic regression maximum likelihood estimators (MLEs) were used to estimate the parameters of the individual-level models of the reenlistment decision.

$$p = \frac{1}{1 + \exp[-(a + \sum_{j=1}^{k} b_j x_j)]}$$

where p is the probability that an individual will reenlist for a term the length of which is defined by the particular dependent variable, b_j are the estimated regression coefficients, and x_j are the independent variables describing the reservist's demographic and military experience and his treatment group. Cases missing data were omitted from the sample, because the MLE method does not handle missing data. This procedure eliminated only 183 cases (1 percent). Also, because data were not available from its paired bonus state, data on South Carolina were omitted from analyses, eliminating another 911 cases. Some 14,221 cases remained for parameter estimation.

Table 6

VARIABLES USED IN THIS STUDY

	Dependent Reenlistment Variables		
REUP	Extension or reenlistment	= 0 1	Separation 1- to 6-year reenlistment
REUP36	Reenlistment for 3 or 6 years	= 0 1	1- or 2-year extension 3- or 6-year reenlistment
REUP6	Reenlistment for 6 years	= 0 1	3-year reenlistment 6-year reenlistment

	Dependent Follow-up Variables		
REUP236	Commitment for more than 1 year	= 0 1	Separation or 1-year extension 2-year extension or 3- or 6-year reenlistment
FSEP	Follow-up, unknown, separated	= 0 1	Definite loss, possible loss, unknown Member
FMEM	Follow-up, unknown, remained	= 0 1	Definite loss Member, possible loss, unknown
FOMIT	Follow-up, unknown, excluded	= 0 1	Definite loss Member

	Experimental Variable		
TREAT	Treatment	= 0 1	Control group Test group

	Demographic Variables		
YOB	Year of birth	= XX	Year of birth, 1935 to 1958 (coded as 35...58)
RACE	Race	= 0 1	Nonblack Black
EDUC	Education	= 0 1	High school graduate or less At least some college
DEP	Dependents	= 0-7 8	Number of dependents from none to 7 8 or more dependents
MSTAT	Marital status	= 0 1	Single Married
SEX	Sex	= 0 1	Male Female

	Military Experience Variables		
PGR	Pay grade	= 1-7	E1 to E7
MOTIV	Motivation	= 0 1	Most recent enlistment not motivated by draft Most recent enlistment was to avoid draft
COMB	Combat MOS	= 0 1	Noncombat primary MOS Combat primary MOS
1TM	First-term male	= 0 1	Reservist is not a first-term male Reservist is a first-term male
LTRM	Length of first term	= 0 1	3-year initial obligation 6-year initial obligation
COMP	Component	= 0 1	National Guard Army Reserve
1STTRM	First term	= 0 1	Current term was not first enlistment Current term was first enlistment

	Regional Characteristics		
UNEMPLOYMENT	Unemployment rate	=	1978 unemployment rate
PER CAPITA INCOME	Per capita income	=	Log of 1978 per capita income

UNADJUSTED DESCRIPTIVE STATISTICS

Retention

The distribution of the reenlistment decision by component for the matched bonus and control groups is shown in Table 7. The retention

Table 7

REENLISTMENT DECISIONS OF CONTROL VS BONUS GROUPS[a]

Term of Commitment	Control Group				Bonus Group			
	Number	% of Sample	% of Non-separators	% of Re-enlistees	Number	% of Sample	% of Non-separators	% of Re-enlistees
United States Army Reserve								
Separate	1336	56	--	--	816	50	--	--
1 year	788	33	74	--	89	5	11	--
3 years	244	10	23	89	244	15	30	34
6 years	29	1	3	11	472	29	59	66
Total	2397	100	100	100	1621	99	100	100
Army National Guard								
Separate	3798	63	--	--	2764	64	--	--
1 year	2110	35	94	--	351	8	22	--
3 years	94	2	4	71	315	7	20	26
6 years	39	0	2	29	911	21	58	74
Total	6041	100	100	100	4341	100	100	100

[a]The observed difference in retention rates between the National Guard bonus and control groups is not significant ($t = -0.83$), but between the Army Reserve bonus and control groups it is significant at 1 percent ($t = 3.74$). The distribution by term of service of the reenlistment decision of the National Guard bonus groups is significantly different at the 1 percent level from the distribution of the control group (chi-square = 2118). The distribution of Army Reserve bonus and control group reenlistment decisions are also significantly different at 1 percent (chi-square = 960).

rate of the National Guard (37 percent) is somewhat lower than that of
the Army Reserve (46 percent). The retention rate of the National Guard
bonus group was slightly, but not significantly, lower than that of the
control group. The difference in retention rates between the Army
Reserve bonus and control groups (50 percent and 44 percent, respectively)
was significant at the 1 percent level.

Figure 1, showing the retention rates of the control and bonus
groups disaggregated by component, term of service, and sex, indicates a
striking similarity in the pattern of retention of the two components
and of bonus and control groups.[3] The retention rate of the first-term
group, however, which consists of a large percentage of draft-motivated
reservists, is lower than that of all other groups.

Length of Term

Longer commitments were made in the bonus group than in the control
group, as shown in Fig. 2. The percentages of those who separated are
similar in the bonus and control groups, but the majority of the
remainder in the control group chose 1-year extensions, whereas the
majority of the remainder in the bonus group chose 3- or 6-year
reenlistments.

MULTIVARIATE ANALYSES

The multivariate analyses presented below pooled observations for
all groups and then estimated the relationship between the dependent and
independent variables. Before presenting the results, we describe three
supporting analyses which provide a rationale for using these
multivariate models: a comparison of the bonus and control groups on
demographic characteristics prior to test implementation; a correlation
analysis describing the extent of multicolinearity of the independent
variables; and an interaction analysis, testing whether the bonus effect
was constant across subpopulations.

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[3] Appendix H contains the distribution of reenlistment decisions
(separate, 1, 3, or 6 years) for these groups.
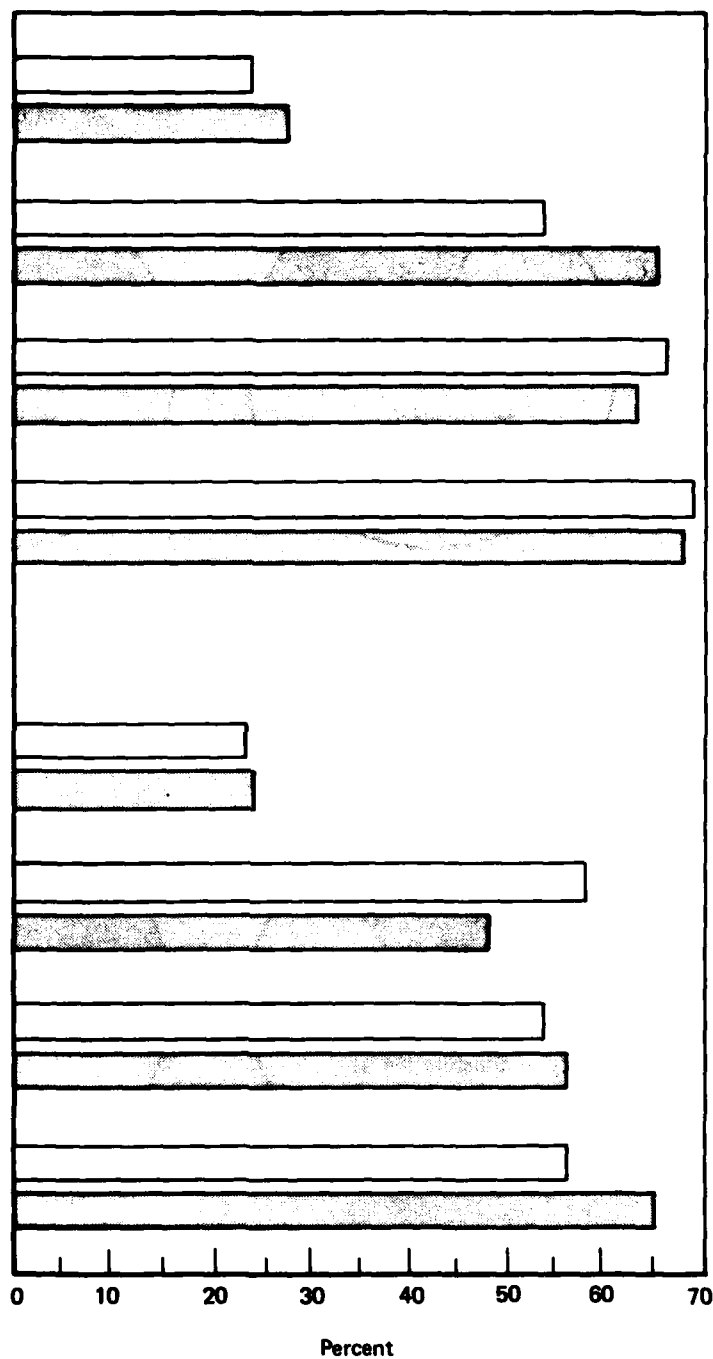
Fig. 1 — Percentage of Army Reservists and National Guardsmen
choosing to extend or reenlist

Army Reserve

Bonus[a]

6 years
(29%)

3 years
(15%)

1 year
(5%)

Separate (50%)

Control

1 year (33%)

3 years
(10%)

6 years
(1%)

Separate (56%)

National Guard

Bonus

6 years
(21%)

3 years
(7%)

1 year
(8%)

Separate (64%)

Control

3 years (2%)

1 year
(35%)

6 years
(0%)

Separate (63%)
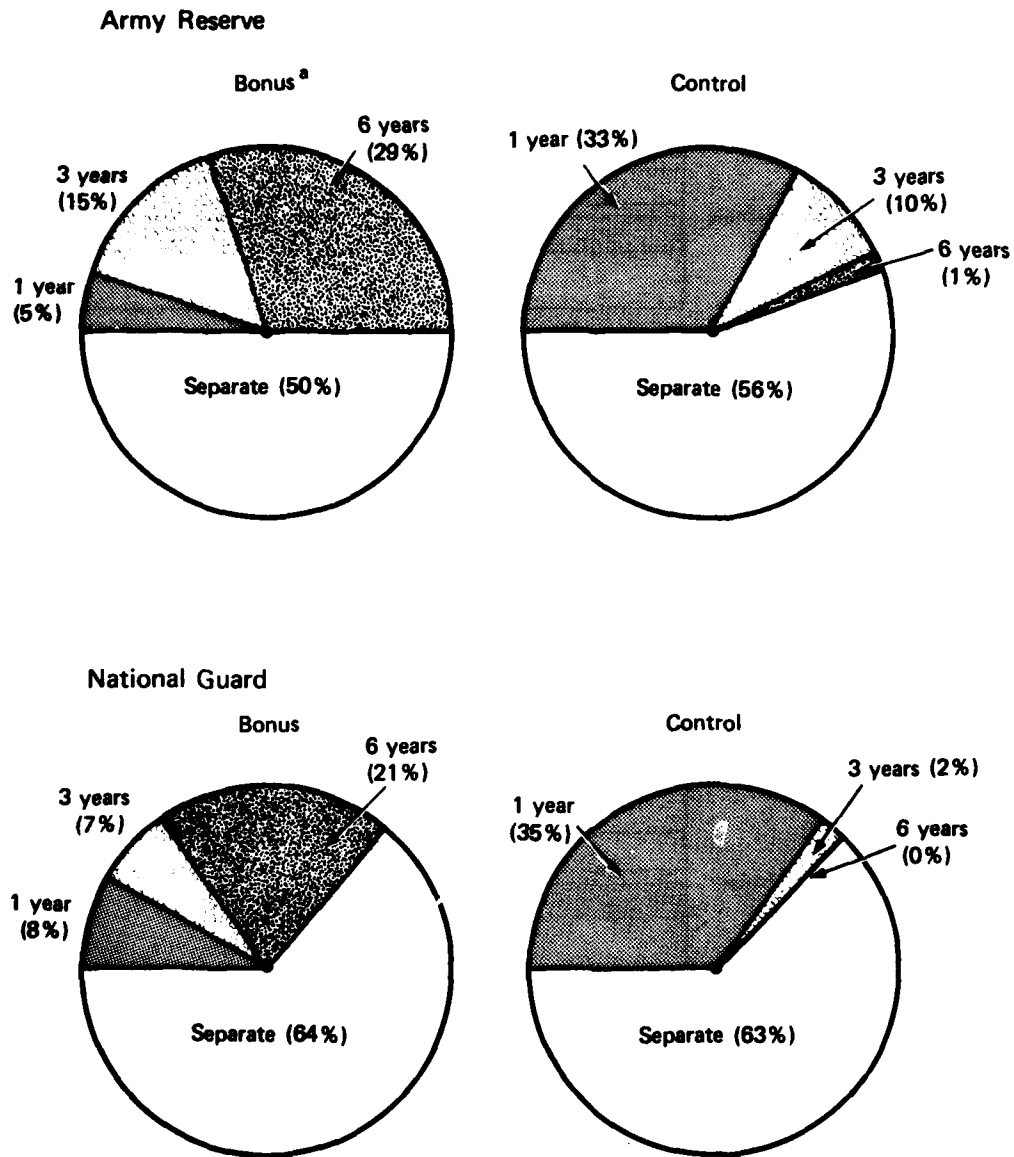
Fig. 2 — Reenlistment decisions in the Army Reserve and
National Guard by bonus and control groups

[a] Does not add to 100% because of rounding.

Comparison of Bonus and Control Groups

The difference between the retention rates of the bonus and control groups in the reserve components cannot be used to make inferences about the effect of the bonus. These small differences may result from imperfect matching of individuals in the bonus and control groups.

To check for the possibility that our results were affected by initial noncomparability of groups, we compared individual

Table 8

POPULATION MEANS FOR VARIABLES IN REENLISTMENT MODEL[a]

	Control	Bonus	t-Ratio
Demographic			
Year of birth	50.78	50.88	1.9
Race	.08	.06	4.2[b]
Education	.36	.42	7.4[b]
Dependents	1.09	.95	7.8[b]
Marital status	.63	.54	11.0[b]
Sex	.11	.15	6.3[b]
Military Experience			
Pay grade	4.45	4.51	4.1[b]
Motivation	.43	.43	0.5
Combat MOS	.30	.29	1.8
First-term males	.55	.56	0.9
Length of first term	.86	.82	5.4[b]
Component	.26	.27	2.1[c]
First term	.63	.67	5.2[b]
Number	9350	5962	

[a]See Table 6 (above) for variable definitions and coding.

[b]Significant at 1 percent.

[c]Significant at 5 percent.

characteristics of the bonus and control groups. The means for the
independent variables for the two groups are shown in Table 8.[4]
With the large sample sizes observed in the bonus and control groups,
relatively small differences in group characteristics may be
statistically significant. As indicated in Table 8, nine of the
thirteen variables showed significant differences between the bonus
and control groups.

An individual in the control group is more likely to be black, less
educated, married, male, in an initial 6-year term, in a lower pay
grade, a member of the National Guard, and in a career path (not first
term); he is also likely to have more dependents than an individual in
the bonus group. The bonus and control groups show no significant
differences in terms of age, entrance motivation, combat MOS, and the
percentage of first-term males.

Because the bonus and control groups differ, any analysis designed
to identify the effects of the bonus offer must be sensitive to the
differences; we therefore used multivariate techniques. The next section
describes the models and provides correlational and interactional
analyses as background for the interpretation of the results.

Correlations

Multicolinearity among independent variables can often mask the
relationship between an independent variable, considered separately, and
the dependent variable. The few large correlation coefficients between
independent variables included in this study are described here.[5]
Married people have a large number of dependents ($r = .68$). In general,
women enlisted initially for 3-year terms ($r = -.86$). Draft-motivated
individuals, by definition, were first-term males who entered the
reserve in 1972. Therefore, high correlations are found between
motivation and first term ($r = .65$) and first-term males ($r = .79$).
Since first-term males are a subset of all first termers, that

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[4] Means by reenlistment decision are shown in Appendix C.
[5] A detailed discussion of the intercorrelations appears in
Appendix I.

correlation is also large ($r = .83$). This suggests that a regression model may show a strong relationship between the reenlistment decision and only one of the three variables (motivation, first term, and first-term male).

Interactions

To allow for the possibility that the treatment had a differential effect on various subpopulations within the study, an analysis was performed to provide MLE estimates of the logistic regression function relating the dichotomous variable, REUP, to the set of 16 independent variables (one treatment, six demographic, seven military experience, and two regional characteristics) and 15 interaction terms. These terms represent the interaction of the treatment (bonus offer) with each demographic, military, and regional variable. An interaction term which significantly contributes to the model indicates that the treatment has a differential effect on individuals. For example, a significant interaction between treatment and sex would imply that men and women respond differently to the treatment. The results showed a gain in explanatory power by adding interaction terms (as measured by a chi-square test), but only one of the coefficients of the 15 interaction terms was significant at the 5 percent level, essentially a random occurrence (see Appendix J).

In particular, no interaction was found between component and treatment. Although the differences in unadjusted retention rates between bonus and control groups were not the same for the National Guard and the Army Reserve, after controls were applied for group differences, the components showed the same response to the treatment. We omitted interaction terms from the analyses, limiting the models to terms which estimate treatment effects that are uniform for all subgroups.

IV. RESULTS

Separation decision, length-of-term decision, and longitudinal participation analyses were conducted to assess the effect of the 1978 bonus. The main results were as follows:

- Although the bonus coefficient is statistically significant in this analysis, the bonus offer increased retention rates only from 38.4 to 40.6 percent. Reserve retention decisions are markedly affected by the demographic composition of cohorts, their prior military history, and the economic characteristics of their region.

- Reservists offered the bonus chose average terms of 4.37 years; those not offered a bonus averaged 1.31-year terms. Demographic composition, previous military experience, and regional economic characteristics influenced the term decision much less than they influenced the separation decision.

- Two years after the beginning of the test, 37.3 percent of the original bonus sample remained, whereas only 30.4 percent of the control sample remained. This gain in strength arises not so much from higher initial retention rates as from lower subsequent attrition as a result of longer terms of commitment.

SEPARATION DECISION ANALYSIS

Bonus Effect on the Entire Sample

This model compared those who chose to separate from the reserves with those who chose to extend or reenlist for 1 to 6 years. Table 9 shows the coefficients of the model and associated t-statistic. The table is organized by the four sets of independent variables describing the reservist's bonus treatment (whether he was in the bonus or control group), demographic characteristics, military experience, and regional economic characteristics. The high level of statistical significance (.1 percent level of confidence) of the log likelihood ratio indicates

Table 9

LOGIT REGRESSION ANALYSES OF SEPARATION DECISION

Variable	Coefficient	t-Ratio
Constant	9.45	
Treatment	.11	2.77[a]
Demographic		
Year of birth	-.04	-6.42[a]
Race	.39	5.17[a]
Education	-.21	-4.97[a]
Dependents	.09	3.75[a]
Marital status	-.12	-2.12[b]
Sex	.05	.33
Military experience		
Pay grade	+.47	18.07[a]
Motivation	-.72	-11.11[a]
Combat MOS	-.19	-4.37[a]
First-term males	-.45	-3.50[a]
Length of first term	-.33	-3.30[a]
Component	.12	2.62[a]
First term	-.13	-1.13
Regional		
Unemployment	.08	5.17[a]
Per capita income	-1.06	-4.22[a]
Number	14,221	
Log likelihood ratio	1184[c]	

[a]Significant at 1 percent.

[b]Significant at 5 percent.

[c]Significant at .1 percent

that the model fits the data well and can be used to gain insights into the determinants of the separation decisions by reservists.

The offer of a bonus has a statistically significant effect (at the 1 percent confidence level) on retention rates: Other things equal, those in the bonus group extended or reenlisted more frequently than those in the control group. This result provides a better estimate of the bonus effect than the raw statistics shown in Table 7, above, since it corrects for the small differences in the characteristics of the population of the test and control areas. Moreover, since many of the demographic, military experience, and regional variables are also statistically significant, the bonus effect cannot be reliably estimated without taking these differences into account.

Using the regression equation to estimate the size of the bonus effect,[1] we find that the bonus offer increased the retention rate from 38.4 to 40.6 percent. Thus, although the effect was statistically significant (i.e., the bonus would increase retention in 99 tests out of 100), the size of the effect is fairly small. Given that a reservist could increase his reserve pay by 20 to 40 percent by accepting a bonus, the 6 percent increase in reenlistment rates suggests that reservists' separation decisions may be only weakly sensitive to pay increases.

Reserve separation rates show strong statistical dependence on the demographic characteristics of those reaching the end of their term of service. The variables corresponding to year of birth, race, educational attainment, and number of dependents show statistically significant effects at the 1 percent confidence level. Marital status is statistically significant at the 5 percent confidence level, while the sex variable is not significant. Some caution is needed in interpreting these variables, however, because colinearity exists with

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[1] The estimation of the effect of a bonus offer with a logistic formulation requires the calculation of the logistic function (probability of retention) for each individual in the sample under two conditions--with and without a bonus offer. The reenlistment rate under each condition is estimated by then calculating the mean value over all individuals in the sample. Thus, two reenlistment probabilities are calculated for each individual by setting the bonus variable equal to zero and one. The values of other variables are set equal to the appropriate value for each individual.

other variables in the analysis and the effects of missing variables may
be present.

Older reservists have a lower separation rate than younger
reservists. The significance of the age variable may be explained by
the effect of a missing variable: the value of reserve retirement
benefits. Since reserve retirement benefits begin at the age of 60,
older reservists are likely to have retirement benefits with a higher
net present value and perceive this value more accurately than younger
reservists. Greater job and family stability also contribute to the
lower separation rate among older reservists, who are less likely to
encounter service-disrupting changes in jobs and family circumstances
since the last enlistment or retention decision.

Because older reservists are more likely to be married and have
dependents, the effects of age must also be interpreted together with two
other demographic variables--marital status and number of dependents.
Other things equal, reenlistment rates increase with age and number of
dependents, but decrease with marriage only. These results suggest that
single reservists have higher retention rates than married, but that
married reservists with dependents have higher retention rates than
either single or married but childless reservists.

This pattern of participation resembles both civilian moonlighting
behavior and participation in voluntary organizations. Moonlighting
incidence[2] rises with age from 16 to 44 and then falls off for older
age groups. Moreover, civilian moonlighting behavior increases with
family size, probably reflecting greater consumption needs.[3] Thus,
were reserve service motivated by the same concerns as moonlighting, one
would expect a similar pattern to that observed.

Voluntary association also depends strongly on age and the
life-cycle stage.[4] Generally, voluntary association membership
increases with age until about 44 and then declines. Among married

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[2] See Multiple Jobholders in May 1978, Special Labor Force
Report 221, U.S. Department of Labor, Bureau of Labor Statistics, Table A.
[3] Bernard Rostker and Robert Shishko, "The Economics of Multiple
Job Holding," American Economic Review, Vol. 66/3, June 1976.
[4] David Knoke and Randall Thomson, "Voluntary Association
Membership Trend and the Family Life Cycle," Social Forces, Vol. 56:1,
September 1977.

persons, participation is lowest for those without children; it
increases with the presence of children and tends to peak during the
middle years (30-44) as the children grow older and leave home. Young
singles tend to participate at higher rates than married people without
children, but at less than the peak rates for older married people with
children. If reserve membership fits the pattern of voluntary
association membership, the propensity for membership should increase
with age and dependents, but not necessarily with marriage. The signs
of the coefficients seem to fit this pattern.

Other things equal, higher retention rates are found among blacks
and those with less education. These results probably reflect either
taste for reserve service or the poorer and more uncertain civilian
economic prospects for blacks and the less educated. The sex variable
was not significant, perhaps because of its colinearity with other
variables in the analysis--namely, length of first term and first-term
male. Therefore, the current model does not provide a good test of the
differential behavior of men and women in the reserve.

Reserve retention rates also show strong statistical dependence on
variables describing previous military experience. The pay grade, type
of military occupational specialty, length of first term, reserve
component, number of previous reenlistments for males, and original
motivation for entrance (draft or nondraft) are all statistically
significant at the 1 percent level of confidence. Of all the variables
tested, pay grade and original motivation for entrance show the
strongest statistical significance.

The higher retention rates with increasing pay grade may reflect the
effects of status within the unit, higher present reserve pay, and
increased future promotion potential, which convert to higher future pay
and retirement benefits. This effect may also reflect self-selection--
those who decide not to reenlist would probably not seek
or be given promotions. If self-selection effects occur, the
coefficient probably reflects an upper bound on the pure retention
effect of an increase in promotion opportunity.

Draft-motivated youth--that is, those with low lottery numbers--had
significantly lower retention rates than reservists who were not seeking

to avoid the draft. Volunteers have greater taste for military service than those who do not join the military voluntarily and will thus reenlist more often. This effect illustrates the key trade-off between manning a reserve force of a given size under a draft or volunteer system. A draft can more easily man a first-term force with higher-quality personnel, but it does so at the cost of having fewer personnel to select for career manning. Thus, the quality of the first-term force must be balanced against the quantity of the career force.

Several factors may contribute to the higher retention in the Army Reserve than in the National Guard. First, the difference in job characteristics between the National Guard and Army Reserve is not fully captured by a simple combat-noncombat variable. Army Reserve jobs tend to be in support areas (medical, transportation, maintenance, or electronics) in which there may be a high degree of civilian transferability. Training in these jobs may thus enhance civilian earnings. Second, promotion opportunities tend to be greater in the Army Reserve, since the grade structure calls for higher pay grades. Thus, the higher Army Reserve retention rate may reflect higher promotion potential. This promotion potential may not be fully reflected in the current pay grade variable. Finally, National Guard call-ups in civilian emergencies may deter continuing participation. Call-ups may not only interfere with personal life, but may also conflict with primary job commitments and actually result in lost income. The Army Reserve is not subject to call-ups except in time of mobilization.

Other things equal, reservists in noncombat jobs reenlist at higher rates than those in combat jobs. Beside the greater risk both in war and peacetime, this lower rate probably reflects the fact that the skills acquired through reserve participation in combat jobs have no civilian counterpart and therefore do not increase the reservists' civilian job opportunities.

Other things equal, males serving their first term had lower retention rates than others; also, shorter initial terms of service led to higher retention rates. Although neither result is surprising, both variables are highly colinear with other variables, thereby dictating a cautious policy interpretation.

The economic characteristics of the region in which a reservist resides show statistically significant effects at the 1 percent level of confidence. Reservists who reside in areas with higher unemployment and lower per capita income have higher retention rates. These results imply an economic motivation for reserve service both in supplementing income and cushioning the risk of income loss through unemployment.

Bonus Effect On Subgroups

The bonus offer may have affected draft- and nondraft-motivated reservists differently. Since 1978 was the last year in which draft-motivated personnel faced a first-term retention decision (1972 was the last draft year), future bonuses will be given only to reservists not motivated by the draft. Estimating the effect of a bonus on this group thus relates directly to future bonus policy planning. Also, a bonus may have a different effect on first-term personnel and those who have reenlisted at least once. Because careerists have already displayed greater taste for reserve service by previous reenlistments, they may be expected to be less influenced by a bonus offer than first-term personnel. Thus, restricting the bonus to personnel at the first-term decision might make sound policy.

To test these hypotheses, the model was reestimated for three subgroups--first-term draft-motivated personnel, first-term nondraft-motivated personnel, and career personnel. Estimates were then generated of retention rates for each subgroup under two conditions-- with and without a bonus.

The results (see Table 10) show the expected large retention-rate differences among the three groups. Draft-motivated personnel reenlist at less than one-half the rate (20.7) of personnel not motivated by the draft (43.9), and career personnel have much higher retention rates (57.0) than nondraft-motivated first termers (43.9). These results imply that after 1978, first-term retention rates should increase dramatically, thereby helping to stem the decreasing strength of the Army Selected Reserve components. In fact, reserve strength figures show a dramatic reversal in 1978, with increases in each year between 1978 and 1982. Part of this reversal can be attributed to the higher retention of volunteer reservists.

Table 10

EFFECT OF THE BONUS ON RETENTION RATES, BY SUBGROUP

(In percentages)

	Retention Rate		
	Control	Bonus	Increase
First Term			
Draft-motivated	21	23	9.5
Nondraft-motivated	49	51	4.1
Career	57	59	3.5
Total	37	39	5.4

The expected higher retention of career personnel reflects the pull of the increasing value of the reserve retirement plan and the self-selection of individuals with a high degree of taste for reserve service through previous decisions. The bonus offer raised retention rates by only 2 to 3 percentage points for each group. As shown in Table 10, offering the bonus to a draft-motivated group raises the retention rate from 21 percent to 23 percent (an 8.7 percent increase); to a nondraft-motivated first-term group, from 44 percent to 46 percent (a 5.5 percent increase); and to careerists from 57 percent to 60 percent (a 4.6 percent increase). Since bonus payments are given to all reenlistees, the bonus will be more cost-effective for those groups having the lowest reenlistment rates. Not unexpectedly, the bonus resulted in the smallest percentage increase and lowest cost-effectiveness for careerists.

LENGTH-OF-TERM DECISION ANALYSIS

Once a reservist has chosen to remain in service, he is faced with one or two additional decisions: First, to extend (1- or 2-year

commitment) or to reenlist (3- or 6-year commitment) and, second, if he chooses to reenlist, to reenlist for 3 or for 6 years. Whereas the model of the separation decison (REUP) used the total population and compared those who separated with those who chose to commit themselves for 1, 2, 3, or 6 years, the models for the next two decisions necessarily use subpopulations only. The reenlistment decision model (REUP36) eliminated those who separated and compared only those at the next decision point, i.e., those who chose to extend for 1- or 2-year terms with those who chose either 3- or 6-year reenlistment terms. The length-of-term decision model (REUP6) eliminated extenders and compared only those who reenlisted for a 3- or a 6-year term. The results of both models are shown in Table 11.

Reenlistment Decision Model: 1 or 2 Years vs 3 or 6 Years

The reenlistment decision model has a higher likelihood ratio than either the separation model or length-of-term model, indicating that the reenlistment decision fits its data set better. The better fit derives mainly from the strong statistical significance of the bonus variable. The major reason for reservists choosing 3- or 6-year terms rather than 1- or 2-year terms was the bonus offer. The bonus raised from 13 to 82 percent the percentage of those remaining in service who reenlist for 3 or 6 years. While the bonus did not raise reenlistment rates appreciably, it had a significant effect on the length of term chosen.

Although the variables measuring demographic composition, previous military experience, and regional economic characteristics are generally statistically weaker in explaining the reenlistment decision than in explaining the separation decision, the direction of the effects are, for the most part, the same for the two models. An implication of the similarity of these effects is that, the bonus offer aside, similar motivations are at work in the separation and reenlistment decisions.

With regard to demographic variables, reservists choosing 3- or 6-year terms tend to have less education and more dependents. These variables are significant at the 5 percent confidence level. Age, race, sex, and marital status are not statistically significant.

Table 11

REGRESSION ANALYSES OF REENLISTMENT AND LENGTH-OF-TERM DECISIONS[a]

Variable	Reenlistment Decision		Length-of-Term Decision	
	Coefficient	t-Ratio	Coefficient	t-Ratio
Constant	13.20		14.36	
Treatment	3.82	41.71[b]	2.46	16.61[b]
Demographic				
Year of birth	.01	.57	-.04	-2.58[b]
Race	.04	.27	-.22	-1.25
Education	-.21	-2.44[c]	-.12	-1.11
Dependents	.11	2.33[c]	-.003	-.05
Marital status	-.17	-1.54	.05	.35
Sex	.33	1.33	-.23	-.70
Military experience				
Pay grade	.12	2.21[c]	.17	2.49[c]
Motivation	-.47	-3.05[b]	-.22	-1.16
Combat MOS	-.24	-2.45[c]	.07	.53
First-term males	.51	2.24[c]	.20	.71
Length of 1st term	-.27	-1.32	-.22	-.82
Component	1.15	11.65[b]	-.56	-4.92[b]
First term	-.05	-.27	.06	.29
Regional				
Unemployment	-.05	-1.50	.02	.58
Per capita income	-1.80	-3.35[b]	-1.63	-3.11[b]
Number	5586		2311	
Log likelihood ratio	1631[d]		239[d]	

[a]See Table 6 (above) for variable definitions and coding.

[b]Significant at 1 percent.

[c]Significant at 5 percent.

[d]Significant at .1 percent.

Several military experience variables have statistically significant effects on the reenlistment decision. Draft motivation and the component are both significant at the 1 percent level of confidence. Pay grade, type of job, and first-term male are all significant at the 5 percent level of confidence. Length of first term and first-term decision are insignificant.

Other things equal, draft-motivated individuals not only have *higher separation rates*, but they also choose shorter terms when not separating. Thus, the influence of the draft will not be completely eliminated in 1978, after all draft-motivated personnel have made first-term reenlistment decisions; the effect will linger through the influence of term choice.

Others things equal, the Army Reserve not only has higher retention rates, but also obtains more 3- and 6-year commitments among those remaining in service than does the National Guard. One hypothesis holds that advancement to higher pay grades may be linked to requiring longer terms of service in the Army Reserve. Because the Army Reserve has a *greater percentage of higher grade positions*, this linkage would imply longer terms for Army reservists.

Other things equal, those in higher pay grades and noncombat MOSs have higher retention rates and choose 3- or 6-year terms more often. However, while first-term males have lower retention rates than others, once they decide to reenlist, they choose longer terms. First-term reenlistment policies might therefore be tightened to make the bonus offer contingent on a commitment of more than 2 years without undue loss of personnel.

Other things equal, reservists in low per capita income areas not only have higher retention rates, but will choose 3- or 6-year terms more often. This effect is significant at the 1 percent confidence level. However, while a higher unemployment rate increases retention, it has no statistically significant effect on the length of the term chosen. Reservists who face unemployment probably want to keep their reserve participation to cushion income loss, but greater unemployment may also increase the likelihood of geographical relocation, which in turn makes longer commitments untenable.

Length-of-Commitment Model: 3 Years vs 6 Years

The length-of-term decision model compared those who reenlisted for
3 years with those who reenlisted for 6 years (see Table 11, above).
The log likelihood ratio, although significant at the .1 percent level
of confidence, is lower than for the separation or reenlistment models,
indicating that this model does not fit its data as well as the other
models. Generally, the demographic, military experience, and
regional characteristic variables show less statistical significance in
explaining the choice of 3- or 6-year terms than in explaining the
separation decision or the reenlistment decision. The bonus variable
dominates the model; the offer of a bonus motivated reservists to
reenlist for 6-year rather than 3-year terms. Among reenlisting
reservists, the bonus increased the percentage of those choosing 6-year
terms from 18.2 to 70.9 percent.

Year of birth was the only statistically significant demographic
variable; the older the reservist, the greater the propensity for longer
reenlistment. Race, marital status, and sex did not differentiate those
who chose 6-year reenlistments from those who chose 3-year
reenlistments.

The higher the pay grade, the more likely the reservist was to
reenlist for 6 years. Although members of the Army Reserve were more
likely than members of the National Guard to reenlist, Army reservists
were more likely than National Guardsmen to choose the shorter (3-year)
reenlistment term. Variables reflecting motivation, combat MOS,
first-term males, length of first term, and first term did not affect
the choice. As was the case for the reenlistment decision, lower
regional per capita income raised the number of reservists contracting
for 6-year terms, while unemployment was not statistically significant.

Gain in Committed Man-Years

The three models were used to estimate the expected probabilities
that each decision--separation, reenlistment, and length of term--would
be made under a bonus and no bonus option. The estimated percentages
are used here to project the frequencies of each extension or
reenlistment option from a sample of 1000 hypothetical reservists

similar to those in the test population. These results are summarized
in Table 12.

The offer of a bonus would increase the retention rate from .384 to
.406. Thus, without a bonus, 616 of 1000 reservists would separate and
384 would extend or reenlist. With the offer of a bonus, 594 would
separate and 406 would extend or reenlist. Among those who choose to
extend or reenlist, the offer of a bonus would increase by 69 percent
the probability of a 3-year or 6-year term being chosen, raising the
rate from .126 to .817. Without a bonus, of the 384 reservists who
choose to extend or reenlist, 336 would choose 1 year and the remaining
48 would choose a 3-year or 6-year commitment (.384 × .126 × 1000). With
the offer of a bonus, 74 would choose 1 year and 332 would choose a
longer term (.406 × .817 × 1000).

Of those choosing a 3-year or 6-year term, the proportion of 6-year
reenlistments would increase from .182 to .709. Thus, with no bonus
offer, of the original 1000, only 48 would choose a 3-year or 6-year
term and of those 48, only 8 would choose the 6-year term (.384 × .126 ×
.182 × 1000). With a bonus, 332 of the original 1000 would choose a
3-year or 6-year term, and of the 332, 235 would choose the 6-year term
(.406 × .817 × .709 × 1000).

Table 12

EXPECTED REENLISTMENT CHOICES WITH AND WITHOUT A BONUS OFFER

(In percentages)

Decision	Without Bonus	With Bonus
Separate	61.6	59.4
Extend	33.6	7.4
Reenlist for 3 years	4.0	9.7
Reenlist for 6 years	0.8	23.5
Total	100.0	100.0

For every 1000 reservists similar to those in the bonus test population, one can expect 504 committed man-years of service without a bonus offer [(1 × 336) + (3 × 40) + (6 × 8)]. With the bonus offered in this experiment, one can expect 1775 committed man-years [(1 × 74) + (3 × 97) + (6 × 235)]. A bonus offer, then, may be expected to more than triple the number of committed man-years.

LONGITUDINAL PARTICIPATION ANALYSIS

The ultimate purpose of the bonus, to increase reserve strength, may be achieved by increasing retention rates and/or the length of time served by those who reenlist. The 1978 bonus offer led to only a small increase in the retention rate, but it resulted in longer terms of commitment. However, the bonus-induced longer terms of commitment do not automatically mean more years of actual service. Increased years of service depend on whether those choosing longer commitments really remain in service longer than those choosing shorter terms. For instance, those who reenlisted for only 1 year may continue to reenlist for 1 year at a time for 6 years, or those who reenlist for 3 or 6 years may leave before completing their commitment. To determine whether the longer years of commitment in bonus regions are resulting in increased actual years of service, we must track both bonus and control groups longitudinally. Longitudinal tracking will indicate whether the combined effects of higher initial retention rates and longer commitments induced by the bonus are being translated into actual higher strength levels.

The membership status of each test participant was determined as of December 31, 1979. Thus, each participant was between 1 and 2 years past the original retention decision. Since test participants who originally chose 1-year terms would by then have made a second retention decision, evaluating the sample at this point would provide an initial indication of whether the longer terms of commitment translate into additional years of service.

The bonus might be said to have had the greatest effect if all reservists who chose 1-year terms had left the reserves by December 31, 1979--or the least effect if all who chose 1-year terms remained. To

estimate the size of the bonus effect in these two instances, we compared membership by applying the basic separation model with two different dependent variables (REUP and REUP236) based on these maximum and minimum reenlistment assumptions to derive upper and lower bounds based on commitment. The results of the analyses of the maximum and minimum reenlistment assumptions appear in the first and second columns of Table 13.

The percentage difference in membership as a result of the bonus under the maximum reenlistment model is 2.2 percentage points (38.4 percent vs 40.6 percent), representing a 6 percent increase in membership attributable to the bonus. Under the minimum reenlistment model, the percentage difference in membership is 24.9 percentage points (8.4 percent vs 33.3 percent), representing almost a 300 percent increase in membership attributable to the bonus. Thus, the estimated effects of the bonus as of December 31, 1979, depend critically on the subsequent retention decisions of those who originally chose 1-year terms.

- To determine the <u>actual</u> bonus effectiveness as of December 31, 1979, we analyzed the follow-up data on membership, using the separation model in the same way we had used the models for the maximum and minimum reenlistment assumptions. As of December 31, 1979, all but 4.9 percent of those in the test could be identified as members or nonmembers. Because the status of that 4.9 percent remained ambiguous, however, we analyzed the models three ways: (1) assuming that the individuals whose December 1979 status was ambiguous had separated, (2) assuming that they remained in service, and (3) omitting them from the analysis.

The three alternative analyses produced estimates of membership (the third, fourth, and fifth columns of Table 13, above) that varied between 5 and 8 percentage points. For instance, using the model excluding the ambiguous group from the analysis (column 5), we find that with a bonus 37.3 percent of the original sample remained, while only 30.4 percent would have remained without a bonus. This represents a 23 percent membership increase due to the bonus as of December 31, 1979. This effect is much larger than the prediction of the maximum 1-year reenlistment model, but much smaller than that of the minimum 1-year reenlistment model (see Fig. 3).

Table 13

SUBSEQUENT PARTICIPATION REGRESSION ANALYSES

| | Retention | | Follow-up Membership | | |
| | 1-yr Reenlistment | | | | |
Variable	Maximum[a] (0 vs 1, 2,3,6)	Minimum (0,1 vs 2,3,6)	Unknowns[b] Separated	Unknowns Remaining	Unknowns Excluded
Constant	9.45	8.59	12.16	10.43	12.11
Treatment	$.11^c$	1.84^c	$.43^c$	$.24^c$	$.37^c$
Demographic					
Year of birth	$-.04^c$	$-.02^d$	$-.04^c$	$-.04^c$	$-.05^c$
Race	$.39^c$	$.18^d$	$.37^c$	$.40^c$	$.40^c$
Education	$-.21^c$	$-.20^c$	$-.25^c$	$-.22^c$	$-.24^c$
Dependents	$.09^c$	$.11^c$	$.09^c$	$.09^c$	$.09^c$
Marital status	$-.12^d$	-.12	-.04	-.07	-.05
Sex	.05	.25	-.12	-.04	-.08
Military experience					
Pay grade	$.47^c$	$.31^c$	$.41^c$	$.44^c$	$.45^c$
Motivation	$-.72^c$	$-.80^c$	$-.76^c$	$-.79^c$	$-.81^c$
Combat MOS	$-.19^c$	$-.21^c$	$-.18^c$	$-.18^c$	$-.19^c$
First-term male	$-.45^c$	-.05	$-.44^c$	$-.40^c$	$-.44^c$
Length of 1st term	$-.33^c$	$-.36^c$	$-.54^c$	$-.52^c$	$-.56^c$
Component	$.12^c$	$.32^c$	$.10^d$	.04	.08
First term	-.13	-.06	-.09	-.10	-.10
Regional					
Unemployment	$.08^c$	.02	$.09^c$	$.08^c$	$.10^c$
Per capita income	-1.06^c	-1.24^c	-1.38^c	-1.15^c	-1.36^c
Number	14,221	14,221	14,221	14,221	13,521
Log likelihood ratio	1184^e	1178^e	1088^e	1165^e	1167^e
Means					
Bonus	.406	.333	.364	.394	.373
Control	.384	.084	.284	.346	.304
Difference	.022	.249	.080	.048	.069

[a]These results, taken from Table 9 (above), are presented here for comparison purposes.

[b]"Unknowns" are those for whom follow-up information was not available or those who may have separated (see Appendix D).

[c]Significant at 1 percent.

[d]Significant at 5 percent.

[e]Significant at .1 percent.
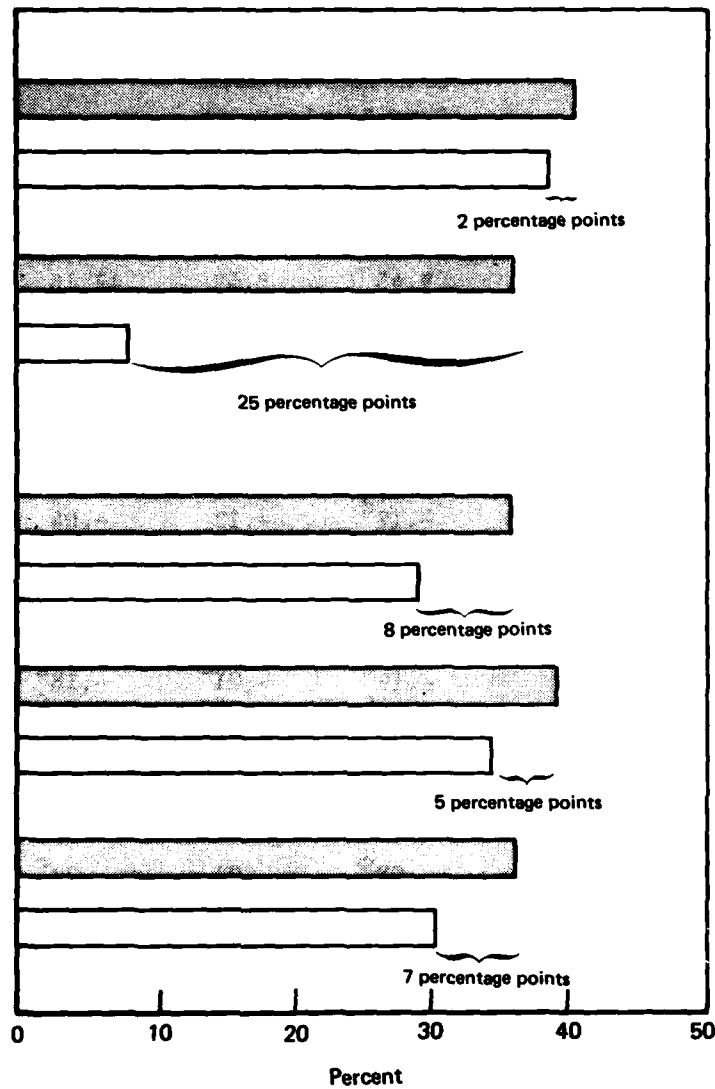
Fig. 3 — Percentage of bonus and control reservists remaining in service 1 year
after experiment completion under two models of reenlistment
behavior and three measures of actual behavior

V. CONCLUSIONS

This study finds that the Selected Reserve lost personnel during the 1970s in large part as a temporary phenomenon of the transition to the All-Volunteer Force and that, although the bonus offer did not substantially increase reenlistment rates, it led to longer terms of commitment, which, in turn, is leading to significantly higher strength through reduced subsequent attrition.

Our analyses show that about two-thirds of the first-term members whose term of service ended in 1978 had enlisted to escape the draft and that they reenlisted at significantly lower rates than nondraft-motivated members (21.4 percent vs 45.0 percent). Thus, reserve strength levels rose after 1978 as draft-motivated personnel left the service and the higher volunteer retention rates began to take effect. In fact, Army Selected Reserve enlisted strength, which had declined to a minimum of 527,000 in 1978, rebounded to 572,000 in 1980.

The bonus offer had a relatively small effect on the overall retention rate, increasing it only 6 percent, from 38.4 to 40.6 percent. The small effect of the bonus holds for draft-motivated males (20.7 to 22.5 percent), nondraft-motivated first-term personnel (43.9 to 46.3 percent), and career personnel (57.0 to 59.6 percent). Acceptance of the bonus would have increased income from the reserve job by 20 to 40 percent; thus, the relatively small increase in retention rates may indicate an insensitivity of retention rates to monetary incentives.

Although the bonus offer did not substantially increase retention, it led to longer terms of commitment. Reenlisting reservists in bonus regions selected 3- and 6-year reenlistment terms much more frequently (82 percent of the time) than those in control regions (12 percent), who tended to limit themselves to 1-year extensions.

Longer terms of commitment, we concluded, translated into higher strength levels. Tracking the reservists 1-1/2 years after they had accepted the bonus and committed themselves to 3- or 6-year terms, we found that of those in the original sample, 37.3 percent of the test group remained in service 1-1/2 years later, while only 30.4 percent of

the control group remained. Giving reservists the incentive to choose longer terms resulted in a 23 percent higher retention rate and thus a stronger reserve.

Thanks mainly to reduced attrition, the bonus will leave an imprint on reserve strength over the entire career span of the participants. Evaluating the effects of the bonus, in theory, entails following up the participants over this career span. The major attrition effects, however, will occur over a 6-year period--the longest term induced by the bonus. Beyond 6 years, the differences in participation between bonus and nonbonus groups will likely remain stable. Thus, as Fig. 4 indicates, the total bonus effect may be estimated by tracking attrition behavior for 6 years.

Although this experiment has provided answers to several critical questions concerning reserve strength, a broader experimental scope would have considerably enhanced the utility of the experiment for reserve personnel policymaking. The congressional restrictions limiting the test to a single incentive, specific bonus amounts, and a specific reserve population considerably decreased the potential value of the test. With more flexibility, and little additional cost, the test could have included varying bonus levels, different terms of service, and a wider reserve population. Different types of incentives, such as educational benefits, could also have been tested. A broader test would have allowed assessment of the relative cost-effectiveness of different incentives for different reserve target groups.
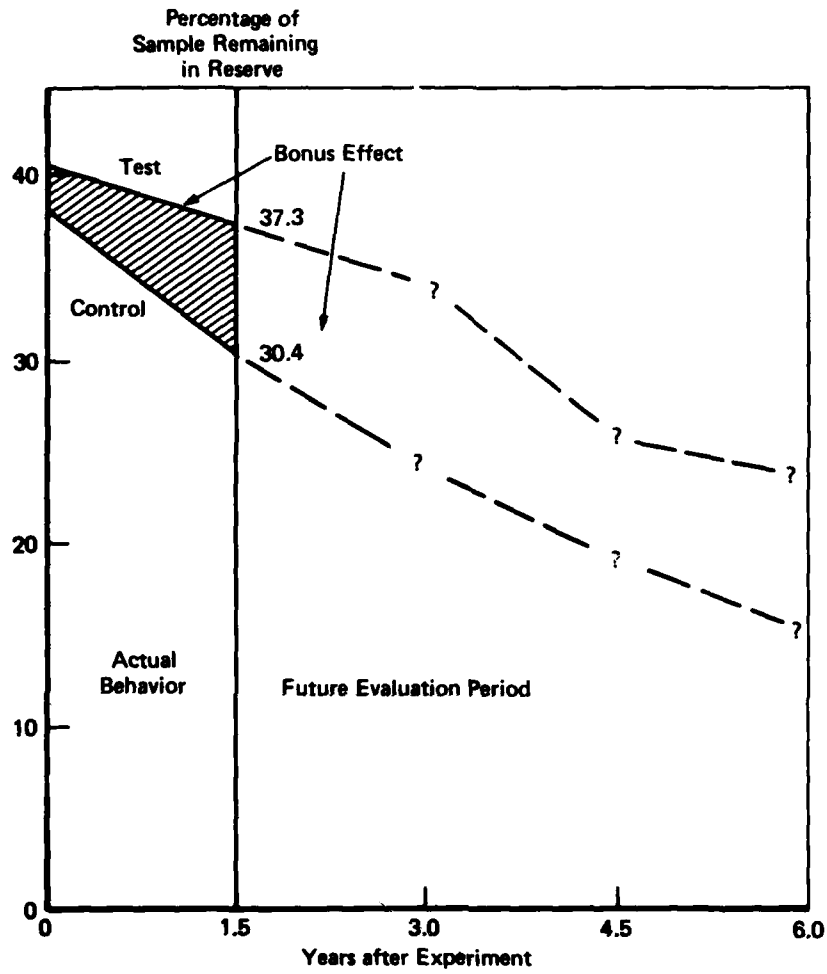
Fig. 4 — Attrition of participants in the 1978 bonus test

Appendix A
SAMPLE SIZE CALCULATIONS FOR BONUS REGIONS

The $5 million congressionally mandated budget limited the bonus sample size. The calculation of the size of the USAR and ARNG samples required a series of assumptions regarding retention rates and the distribution of the choice of term of commitment in the presence of a bonus. The steps required to calculate this maximum sample size and the assumptions are given below.

Step One--Calculation of average bonus payment for a reenlistee choosing a 3- or 6-year option. We assumed here that no past bonus amounts would be repaid, but that a reservist who broke a commitment would cease to receive further bonus payments.

Let

B = average payment for a 3- or 6-year term
L = annual loss rate among bonus reenlistees

Based on data provided by the Reserve Compensation System Study Group (RCSSG), a value of $L = .06$ was used for both the National Guard and Army Reserve.

3-Year Option:

$$B = 450 + \sum_{i=1}^{3} (150)(1 - L)^i$$

The estimated average payment for a 3-year reenlistment term was $848.

6-Year Option:

$$B = 900 + \sum_{i=1}^{6} (150)(1 - L)^i$$

The estimated average payment for a 6-year term was $1629.

Step Two--Assumptions concerning 1-, 3-, and 6-year terms.
Estimates were made of the distribution of choice of term of service for
those choosing to remain in the reserve. Three choices were possible:

  1-year term--no bonus
  3-year term--$900 bonus
  6-year term--$1800 bonus

From data provided by RCSSG from the Nebraska bonus experience, we
postulated that of those who remained in service,

  5 percent would choose a 1-year term
  24 percent would choose a 3-year term
  71 percent would choose a 6-year term.

Step Three--Calculation of average bonus payment per guardsman
or reservist who remained in service. Payment was calculated as
follows:

$$A = (\$848)(.24) + (\$1628)(.71) + (\$0)(.05) = \$1360$$

Step Four--Estimation of retention without bonus. Retention
rates without the bonus were assumed to differ between first-term
and career reservists. RCSSG provided the following estimates of the
national retention rates: In the National Guard, 23 percent for first
termers and 56 percent for reservists with 6 and 7 years of service; in
the Army Reserve, 27 percent and 58 percent.

Step Five--Estimation of retention with bonus. The effect of
the bonus on retention was predicted as follows. First, the gain in
annual reserve income for a reenlistee was estimated using a present
value calculation.

3-Year Term:

$$\frac{G}{100} = \frac{900 + \sum_{i=1}^{6} \frac{W_B}{(1+d)^i}}{\sum_{i=1}^{6} \frac{W_0}{(1+d)^i}}$$

6-Year Term:

$$\frac{G}{100} = \frac{450 + \sum_{i=1}^{3} \frac{W_B}{(1+d)^i}}{\sum_{i=1}^{3} \frac{W_0}{(1+d)^i}}$$

where

G = estimated annual percentage increase in reserve income
resulting from the bonus

d = discount rate

W_B = annual reserve income with a bonus

W_0 = annual reserve income without a bonus

The discount rate assumed for the calculation was 10 percent. The
annual pay without a bonus was assumed to be $1500--approximately the

pay of an E5 with 6 to 8 YOS. The annual pay with a bonus was then $1650.

Estimates based on these assumptions show the percentage reserve pay increase to be 22 percent for a 3-year term and 24 percent for a 6-year term. Although it was assumed that an equivalent pay increase was given to those choosing 1-year extensions, it was also assumed that only 5 percent would choose 1-year extensions. Thus, only a small error may be included in the estimate.

An elasticity of 1.0 was then assumed with respect to the annual secondary wage; that is, a 24 percent pay increase would raise retention rates by 24 percent. This assumption was consistent with both the Gates Commission assumptions applied to our sample and measurements of civilian moonlighting pay elasticities. The reenlistment rates that would thus result from the bonus are shown below, alongside the national reenlistment rates provided by RCSSG.

	Historical Rate	Bonus Rate
For the National Guard		
First term	23%	29%
6 and 7 years of service	56%	69%
For the Army Reserve		
First term	27%	34%
6 and 7 years of service	58%	72%

Step Six--Calculation of number of eligibles. The following formula was used to calculate the sample size for bonus regions:

$$N(PR + QS)b = B$$

where

N = sample size for bonus regions

P = percentage of eligibles who are first termers

R = retention rate for first termers

Q = percentage of eligibles who are not first termers

S = retention rate for non-first termers

b = average bonus payment per retained reservist or guardsman

B = total component budget for bonus test

The National Guard was allocated $3 million and the Army Reserve $2 million for bonus payments. Applying the above estimates, we find:

Guard: $N[(.71)(.29) + (.29)(.69)]$ $1360 = 3,000,000$

Reserve: $N[(.48)(.34) + (.52)(.72)]$ $1360 = 2,000,000$

Thus, the bonus sample size is 5400 for the National Guard and 2700 for the Army Reserve.

Appendix B

DESCRIPTION OF THE DATA BASES USED IN MONITORING AND EVALUATING
THE 1978 BONUS TEST

The analyses described in this report were based on information
about the demographic characteristics, economic environment, military
experience, and reenlistment behavior of approximately 15,300 members
of the Army National Guard (ARNG) and United States Army Reserve (USAR).
They were selected from a slightly larger population, in both bonus and
control areas, about whom information was available. Those selected met
a set of analytic criteria established to ensure that the analytic
population would not be biased in any way.

The sample for our analyses, chosen as part of a major review
of participants in early 1978, included only individuals who were
identified as members of the bonus or control areas prior to the
initiation of the bonus test, whose term of service expired in 1978,
and who had served for less than 8 years. We excluded individuals
who were identified by ARNG or USAR as ineligible to participate for
administrative reasons (e.g., attendance) or allowed to receive a bonus
under special circumstances. By definition, the analytic population
is a subset of the total, or administrative, population about whom we
maintained records and collected reenlistment behavior data during our
monitoring of the 1978 bonus test.

The information about the administrative population originated from
such diverse sources as eligibility lists, administrative personnel
records, a monthly reporting system, and a survey questionnaire. This
appendix (1) identifies these data sources and describes the procedures
used in creating and maintaining the data files associated with
monitoring the bonus test and (2) explains the criteria used in
selecting the analytic population.

DATA SOURCES

Initial Eligibility Rosters (IER)

Before the test was initiated, each component produced official lists, by unit, of every individual who met the eligibility criteria in both bonus and control areas. An official roster was created from these individual lists for the purpose of monitoring the experiment. The roster was used as an eligibility verification source by the U.S. Army Finance and Accounting Center when requests for bonus payments were received. For estimating overall test costs, the roster was used as an indicator of the size of the bonus-eligible population. When aggregated to the unit level, the roster was used by Rand as a distribution list for the survey questionnaires described below.

The Army Reserve submitted the IERs as hard-copy lists, one for each of the 617 units containing individuals who met the eligibility criteria for the bonus test. The Army National Guard submitted the IERs as a computer file combined with Reserve Personnel Master File records.

Reserve Personnel Master Files (RPMF)

Since the IER contained only a limited amount of information about bonus-eligible individuals, Rand also requested their RPMF records. Linking the IER and RPMF at the individual level allowed us to verify bonus-eligibility. The variables used for this determination, which appear on both sources, could be checked. Furthermore, the RPMF contained a more extensive set of individual data which could be used for evaluating the bonus test. Items such as race, education, and marital status were hypothesized as possible explanatory variables for the reenlistment decision. The RPMF was the most logical and complete source from which to obtain this individual information.

The USAR submitted three RPMF computer tapes, one for each of the participating armies (First, Fifth, and Sixth). As indicated above, the ARNG submitted the RPMF records and IER data as a combined file.

Monthly Status Reports

By the 15th of each month, each unit participating in the program, whether in a bonus or control region, submitted a report containing the reenlistment decision of each bonus-eligible individual who had reached the end of his term of service in the preceding month; e.g., for individuals with ETS dates in March, a report was to have been submitted by April 15. These reports listed individuals who either separated or reenlisted and, for those who reenlisted, the length of the term selected.

USAR units forwarded individual monthly status reports up the chain of command to Army Headquarters for subsequent transmission as hard copy to ODASD (Reserve Affairs) and Rand. The ARNG coordinated unit reporting through its centralized computer system; a monthly data tape containing reenlistment and separation transactions was transmitted to ODASD (Reserve Affairs) and Rand.

Survey Questionnaires

Data to model the process by which individuals decided whether or not to reenlist were collected by means of a self-administered questionnaire. The questionnaire was distributed to all bonus-eligibles in both bonus and control regions as part of the processing related to reenlistment or separation. The questionnaire collected information on military experience, demographic background, family resources, labor-force experience, and factors related to the reenlistment or separation decision.

In the USAR, completed questionnaires were returned by units directly to Rand on a monthly basis. In the ARNG, completed questionnaires were collected at the state headquarters of each participating state and forwarded to Rand.

THE ADMINISTRATIVE POPULATION AND DATA BASE

The administrative population for the bonus test consisted of any individual, in both test and control areas, who was ever considered eligible for the bonus. This definition included both individuals whose

eligibility was verified and those who were found to be ineligible. Rand monitored the bonus test, collected reenlistment and eligibility-related information by creating and continuously updating an administrative file, or automated eligibility roster, for each component.

United States Army Reserve

The USAR administrative file was created in February 1978 from hard-copy IERs and the Reserve Personnel Master Files (RPMF). Each individual thought to be bonus-eligible, in both bonus and control areas, should have been listed on an IER, and an RPMF record should have been available for each person. In practice, our initial processing identified missing records and discrepant information.

A machine-readable file of 4802 records was created from the 617 IERs and was merged with the RPMFs by means of Social Security numbers (SSNs). The process identified almost 400 instances of mismatch; e.g., either an SSN was on the IER but no RPMF record found, or SSNs matched but names did not. USAR resolved some of these problems; others, e.g., missing RPMF records, were never resolved.

As part of creating the administrative file, we verified bonus test eligibility with a set of computer algorithms. Expiration of term of service in 1978 was verified and length of term was calculated from ETS and pay entry base date (PEBD). (We did not have information with which to verify other criteria, e.g., occupational qualifications or attendance.) A comparison of information on the IER with data on the RPMF disclosed discrepancies. For example, we found instances in which the IER indicated a 1978 ETS date but the RPMF did not. If the former was correct, the individual was eligible for a bonus; if not, he was ineligible. About 700 of the 4802 records processed, or 15 percent, were initially flagged as "may not be bonus-eligible."

Information about each of the 700 individuals whose eligibility was questioned was transmitted to the appropriate army through Reserve Affairs. In turn, the armies contacted individual units for clarification; modifications, corrections, and additions were returned to Rand. Most of the corrections pertained to ETS and PEBD dates. In

cases of IER-RPMF discrepancies, we had relied on the RPMF. In fact, the data on the IER proved to be more recent. Additions involved cases of individuals who had been omitted from the original IERs and who were not previously considered bonus-eligible by USAR.

Several additional groups of individuals were identified and flagged as part of the eligibility review. Two groups in the Army Reserve were allowed to receive a bonus by ODASD (Reserve Affairs), although they were not eligible. One group of approximately 60 reservists had more than 8 years of service on receiving the bonus; some 20 others had extended their term of service for a short period in order to become eligible for the bonus. Also, approximately 50 members of the Church of the Latter Day Saints (Mormons) were identified as having more than 8 years of service on the basis of ETS-PEBD calculation. However, their records included service discontinuities related to their religious obligations, and OSD allowed them to receive a bonus if they reenlisted.

Some 700 records had originally been questioned; by the end of the eligibility review, about half of the problems were resolved either with file corrections or special file notations.

Between this major review of the population in the administrative file and the end of the bonus test, minor adjustments continued to be made to individual records. These adjustments resulted either from problems encountered as part of processing the monthly status reports or in response to requests from the USAR either to add individuals or to consider them ineligible for the bonus.

By the end of the bonus test, the administrative file for the USAR contained 4833 names. The distribution of these individuals, in terms of various bonus-eligibility categories, is shown in Table B.1.

The Army National Guard

The Army National Guard submitted the IER and RPMF data as a single machine-readable file. The file was created by the National Guard Bureau from information submitted by each of the 13 states in the bonus test and contained 12,163 records, i.e., one record for each individual thought to be eligible for the bonus.

Table B.1

FINAL ELIGIBILITY CLASSIFICATION OF THE ADMINISTRATIVE POPULATION
FOR THE UNITED STATES ARMY RESERVE

Classification	Number	Percent
Eligible		
On basis of original Rand review	3955	81.0
USAR review, March 1978	241	4.9
USAR review, July 1978[a]	17	0.3
Member of Mormon Church[a]	49	1.0
OSD exemption for more than 8 years of service[a]	59	1.2
OSD exemption for short-term extensions[a]	17	0.3
USAR review, August-December 1978[a]	27	0.6
Ineligible		
Disqualified by USAR or unresolved problems[b]	518	10.6
Total	4883	99.9

[a]Excluded from analytic population.

[b]Includes about 400 unresolved ETS and PEBD problems from initial review; excluded from analytic population.

In creating the administrative file for the USAR, we merged data from the IER and RPMF for each individual and compared and verified the two sources. Since we received only a single machine-readable file for the ARNG, based on one source, no comparisons were possible. We were restricted to verifying ETS and PEBD dates, ensuring that critical data elements (e.g., SSN and state) were included, and checking for duplicate records. About two dozen problems were identified and resolved through the National Guard Bureau.

During the first several months of the bonus test, the ARNG reviewed the administrative file and identified approximately 500 individuals who were not bonus-eligible for a range of administrative and data-related reasons and a small group of about 20 individuals to be added. Since about 300 of the changes involved two test states, we

asked Reserve Affairs to conduct a special review to verify that no irregularities had taken place.

Reserve Affairs verified that the deletions were appropriate, because the original bonus-eligible population had been specified incorrectly by these two states. We were also informed that one of these two states would be deleting several hundred more individuals to correct the riginal error. The state identified subsequent deletions as part of its monthly status reports.

Between this major eligibility review and the end of the bonus test, additional modifications were made to the administrative file, primarily at the request of the National Guard Bureau. In almost all instances, the request was to flag an individual as ineligible for the bonus for occupational or attendance reasons; additions to the file were rare.

The distribution of individuals, in terms of the various eligibility classifications, is shown in Table B.2.

Table B.2

FINAL ELIGIBILITY CLASSIFICATION OF THE ADMINISTRATIVE POPULATION
FOR THE ARMY NATIONAL GUARD

Classification	Number	Percent
Eligible		
On basis of original Rand review	11,292	92.6
Added by ARNG after start of bonus test	39	0.3
Deleted, then added by ARNG after further review[a]	25	0.2
Ineligible		
Record deleted by ARNG or unresolved problem[b]	844	6.9
Total	12,200	100.0

[a] All from one state, excluded from the analytic population.

[b] Includes 520 from one state, 120 from a second, and the remainder distributed in the other 11 states; excluded from the analytic population.

MONITORING THE BONUS TEST

Rand developed a file management system so as to update, modify, and produce regular reports from the administrative file. In monitoring the USAR, we first created a data set from the hard-copy monthly status reports and then used the file management system to update the administrative file. With SSN as the key, the system updated the records to indicate whether individuals listed on the monthly status report had separated or reenlisted, the term of reenlistment, and the reporting month. The file management system also enabled us to add individuals to the administrative file, as well as to change their eligibility classification. Monitoring the ARNG was somewhat simpler, because it sent a monthly data file instead of hard-copy reports.

The Rand file management system produced two types of reports on a monthly basis. The first report displayed the cumulative frequency of reenlistment decisions of bonus-eligible individuals in each of the bonus and control areas by ETS month, including those with ETS dates prior to that month as well as others who made an early decision.[1] For example, the May 1978 report included the reported reenlistment decisions for personnel whose term of service ended between January and May, as well as those between June and August.

ODASD (Reserve Affairs) used these monthly summaries in preparing quarterly reports to Congress. Through these monthly summaries, we identified bonus and control areas with missing data and reporting lags. For example, the May 1978 summary showed a state with data missing for many personnel whose term of service ended between January and March and another state with almost no reports for individuals with May 1978 ETS dates. ODASD (Reserve Affairs) subsequently contacted states or areas with reporting problems and obtained missing or lagging data.

A second report identified personnel, by SSN, with either missing, discrepant, or duplicate data. For example, if a reenlistment decision was not received within 3 months of ETS, the omission was reported and data were requested from the responsible component. Discrepancies in

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[1] An individual was allowed to make a decision up to 90 days prior to ETS. In addition, all individuals whose term of service ended between October and December 1978 were required to make a decision prior to September 30, 1978.

the data included the report of more than one decision for a single individual or an individual's name appearing on a monthly status report from a region other than the one shown in the administrative file.

By the end of the experimental reporting period (January 1979), reenlistment decisions had been received for 97.5 percent of the individuals classified as eligible for the bonus. Within three months, we obtained reenlistment decisions for most of the remaining cases and resolved almost all of the discrepancies. The final administrative file contains a reenlistment decision for 98.0 percent of the administrative population classified as eligible for the bonus in the test areas and 97.8 percent in the control areas.

THE ANALYTIC POPULATION AND DATA BASE

In monitoring the bonus test, we obtained and regularly reported the reenlistment decisions of individuals in both bonus and control areas who had been classified as eligible for the bonus; i.e., bonus-eligible members of the administrative population. In evaluating the bonus test, we excluded a subset of this population on the basis of analytic criteria established to ensure that the analytic population would not be biased in any way.

As indicated in the Introduction, one way in which we ensured the integrity of the test and the quality of the data was by identifying the eligible population prior to the assignment of areas to either the bonus or the control group. The eligibility review described above also identified ineligible cases, as did cor··ications from the components throughout the test. Nevertheless, there remained in the administrative population several groups of individuals who, while eligible to receive the bonus, would bias the results if they were included in the analytic population. Specifically, these were individuals who received bonuses and were added to the bonus group considerably after the start of the bonus test or who were allowed by ODASD (Reserve Affairs) to receive a bonus under special circumstances. Since we were not asked to add the counterparts of these individuals--i.e., late additions and special cases--to the control group, we felt that these exclusions were

appropriate.[2] Our definitions of the analytic population, by
component, are given below.

In the USAR, we included in the analytic population only those
we originally classified as bonus-eligible and those whose records we
questioned, corrected, and reclassified as bonus-eligible in March 1978
(see Table B.1). We did not include the 169 individuals who were late
additions, members of the Church of the Latter Day Saints, and special
OSD exemptions. All of these individuals were in USAR test areas and
almost all received a bonus. Our definition resulted in an analytic
population of 4196. In creating the analytic data base, we excluded 175
individuals who were bonus-eligible by cur analytic definition but for
whom RPMF records were not available. This resulted in an analytic file
of 4021 usable records.

The National Guard portion of the analytic population included only
individuals who were eligible on the basis of the original Rand review
and who were not deleted subsequently by the component, plus a few
additions (see Table B.2). In creating the analytic data base, we
excluded 37 individuals for whom we did not receive RPMF records. The
ARNG analytic file contains 11,294 usable records.

Table B.3 summarizes the records excluded from the administrative
data base in creating the analytic data base. The distribution of the
analytic population, by component and bonus and control areas, is found
in Table 4 (Section II, above).

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[2] Before records were excluded, a file created from the
questionnaires received in response to the Bonus Test Survey was merged
with the administrative file. Since this report does not utilize any of
the survey data, the details and results of that process are omitted.

Table B.3

COMPOSITION OF THE ANALYTIC DATA BASE, BY COMPONENT

Category	National Guard	Army Reserve	Total
Records on the final administrative file	12,200	4,883	17,083
Excluded, not eligible for analysis	869	687	1,556
Excluded, eligible for analysis but missing RPMF	37	175	212
Records on final analytic file	11,294	4,021	15,315

Appendix C
MEAN VALUES OF INDEPENDENT VARIABLES, BY REENLISTMENT DECISION

The discussion in Section IV of mean values for bonus and control groups indicated that the individual characteristics should be controlled by including them as independent variables in a reenlistment model. To describe the reenlistment decision in a single model, the relationship between the length of commitment (separation being zero) and each independent variable must be linear, i.e., the observed difference between the means of the 1-year and 3-year groups would be twice that of the observed difference between the separation and 1-year groups; the observed difference between the means of the 3- and 6-year groups would be 3 times as large.

The mean values of the independent variables are shown in Table C.1 for the bonus and control groups, by the reenlistment decision. The National Guard and Army Reserve samples are combined. In comparing the means across the *four reenlistment decisions*, one notes that the length of commitment (0, 1, 3, or 6 years) is not linearly related to the independent variables.

Table C.1

MEAN VALUES OF INDEPENDENT VARIABLES FOR BONUS AND
CONTROL GROUPS, BY REENLISTMENT DECISION

	Bonus Group				Control Group			
	Reenlistment Decision				Reenlistment Decision			
Variable [a]	Separate	1 Year	3 Years	6 Years	Separate	1 Year	3 Years	6 Years
Demographic								
Years of birth	51.30	50.10	50.59	50.18	51.15	50.11	50.03	49.53
Race	.05	.07	.10	.07	.05	.11	.17	.15
Education	.39	.47	.42	.39	.42	.35	.34	.40
Dependents	.97	1.06	.99	1.11	.87	1.21	1.18	1.24
Marital status	.61	.60	.50	.56	.54	.64	.59	.62
Sex	.10	.10	.29	.23	.08	.16	.35	.26
Military experience								
Pay grade	4.37	4.75	4.64	4.74	4.36	4.62	4.67	4.82
Motivation	.56	.31	.23	.22	.56	.24	.17	.25
Combat MOS	.31	.34	.21	.25	.28	.34	.12	.24
First-term males	.70	.40	.32	.34	.68	.34	.26	.37
Length of 1st term	.88	.87	.68	.73	.89	.79	.60	.72
Component	1.23	1.20	1.44	1.34	1.26	1.27	1.72	1.42
First term	.77	.47	.55	.50	.74	.44	.47	.57
Number	3580	440	557	1383	5134	2898	338	68

[a] Variables are defined in Appendix F.

Appendix D
DESCRIPTION OF DATA USED IN THE FOLLOW-UP ANALYSIS

The follow-up analysis reported in Section IV was designed to assess the extent to which committed man-years translate into actual man-years. The analysis was based on information about the reserve membership status of the analytic population as of December 1979, i.e., 1 year after the end of the bonus test. This appendix describes the sources and limitations of the follow-up data, the assumptions made in processing the data, and some initial findings.

DATA SOURCES AND DESCRIPTION

The Reserve Components Common Personnel Data System (RCCPDS), the data source used to follow up the behavior of individuals in the bonus test after the program ended, is a standardized, centralized data base containing personnel information on all members of the reserve. Maintained for the Reserve Affairs Directorate of OASD (MRA&L) by the Defense Manpower Data Center (DMDC), the RCCPDS is the official source for accession, separation, and reenlistment information. Whereas the Rand monitoring system for the bonus test provided a way to check and verify data received from the components, however, the RCCPDS does not have such a capability. As described in Appendix B, the Rand monitoring system routinely produced reports of inconsistent transactions or missing information and asked the components for verification. As a result, the analyses reported in Section IV were based on information about the separation or reenlistment behavior of almost every individual in both bonus and control areas. The data available for the follow-up analysis, on the other hand, is less complete and subject to a larger percentage of data-entry and documentation errors.

To follow up the experimental population, Rand sought to update its administrative file with the help of DMDC. DMDC attempted to match 1979 RCCPDS records for individuals in the Rand administrative file on the basis of Social Security numbers and then to check each match with several other data elements included in both files. In addition, DMDC

also checked loss transaction files received from the reserve components for 1979 so as to identify 1979 losses that may not have been updated in the RCCPDS itself.

The follow-up effort included the 17,083 individuals on the administrative file; the discussion here is restricted to the analytic population of 15,310 defined for Rand analyses (see Appendix B).[1] DMDC found records for 8,138, or 53.25 percent, of the 15,310, indicating that at the end of 1979 slightly over half were either still members of a reserve component or had separated prior to December. Since over 40 percent of the 15,310 had actually separated in 1978, a more careful examination in terms of 1978 behavior is required.

Table D.1 shows the efficiency of the match in terms of separations and reenlistments as of December 1978, the end of the experimental period. The table shows that RCCPDS records were found for most of the individuals who could have been expected to be members of a reserve

Table D.1

RESULTS OF THE 1979 RECORD SEARCH BY 1978 STATUS

1978 Status	1979 Record Search			
	Matched	Unmatched	Total	Percent Matched
Separated	2515	6704	9219	27.3
Reenlisted				
1 year	2945	363	3308	89.0
2 years	383	26	409	93.6
3 years	886	32	918	96.5
6 years	1409	47	1456	96.8
Total	8137	7172	15,310	53.1

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[1] The analytic population is actually 15,315; five records were erroneously omitted from this analysis.

component in 1979 or whose term of service ended in 1979 (after a 1-year extension in 1978) and who either separated or reenlisted in 1979. A more detailed discussion, based on 1978 status, follows.

1978 Separations. This group consisted of individuals whose original term of service ended in 1978 and who separated from the reserve during the experimental period. It is not surprising that only 27.3 percent of their records were matched in 1979, since most of them were RCCPDS loss transactions during 1978. Individuals for whom records were found consist primarily of those who separated in 1978 but for whom a loss transaction was not processed until 1979, reflecting the fact that while the Rand monitoring system recorded 1978 separations, the RCCPDS lagged. In addition, 423 who separated during 1978 but who reentered the reserve in 1979 were identified by the notation on their RCCPDS record of an ETS date later than December 1978.

One-Year Extensions. This group consisted of individuals whose original term of service ended in 1978 and who, during the experimental period, extended for 1 year and, during 1979, either extended again or separated. Records were identified for 89 percent of this group.

Two-Year Extensions. Most of the members of this group should have been in the RCCPDS at the end of 1979. Based on a 2-year extension in 1978, they should have a 1980 ETS date. As the table indicates, 94 percent of them were identified.

Three- and Six-Year Reenlistments. Records were identified for about 97 percent of both these groups, which include, for the most part, personnel who reenlisted during the experimental period and received a bonus. DMDC staff suggest that a failure to match a 1979 record may be the result of several factors. First, an SSN may have been incorrect either on the administrative file or on the RCCPDS. Also, an update to the RCCPDS or a loss record may have been in transit between the reserve components and DMDC at the time the matching was undertaken. Finally, some of the individuals who reenlisted, but were not located, may have separated during 1978; a loss record may exist for them in the 1978 files, which were not searched.

DATA ASSUMPTIONS

Several assumptions were made in classifying individuals for the purposes of the attrition analysis:

*   Individuals with an active RCCPDS record and an ETS date of January 1979 or later were assumed to be members of the Selected Reserve as of December 1979.

*   Individuals who had an active RCCPDS record during 1979, i.e., one without a loss transaction, but who had an ETS date prior to 1979, are considered possible losses to the Selected Reserve. We assumed that the absence of a new ETS date indicates that their loss record will be processed at a later date.

*   Individuals who separated during 1978 and for whom 1979 records were not identified are assumed to be definite losses to the Selected Reserve.

*   Individuals known through Rand's system to have reenlisted during 1978 but for whom neither an active RCCPDS record or a loss record has been identified were assigned "unknown" status.

*   A small group of individuals whose matched records indicate membership in the Individual Ready Reserve or Standby Reserve are considered losses to the Selected Reserve.

The basic classification shown in Table D.2 results from applying these assumptions to the data. We note, first, that about 5 percent of those who separated from the Selected Reserve in the experimental period reenlisted within a relatively short time. Second, 1979 Selected Reserve status is clearly a function of the length of the extension or reenlistment made during 1978; the longer the period, the greater the likelihood that the individual remained a member at the end of 1979. This is understandable in that individuals who extended for 1 year in 1978 faced a similar decision in 1979, at which point they could either have separated, extended, or reenlisted. Those who reenlisted for longer periods would have had to break a commitment to the Selected

Table D.2

DECEMBER 1979 CLASSIFICATION, BY 1978 STATUS

	Status at End of 1978											
	Separated		Extended				Reenlisted				Total	
			1 year		2 years		3 years		6 years			
Classification December 1979	N	%	N	%	N	%	N	%	N	%	N	%
Member	423	4.6	2095	63.3	325	79.5	773	84.2	1294	88.9	4910	32.0
Possible loss	105	1.1	151	4.6	2	0.5	10	1.1	13	0.9	281	1.8
Definite loss	8691	94.3	699	21.1	56	13.7	103	11.2	101	6.9	9650	63.0
Unknown	0	0.0	363	11.0	26	6.4	32	3.5	47	3.2	468	3.1
Total	9219	100.0	3308	100.0	409	100.0	918	100.0	1455	100.0	15,309	99.9
Percentage of Unknowns[a]												
Separated		4.6		63.3		79.5		84.2		88.9		32.0
Remaining		5.7		68.9		86.4		88.8		93.0		36.9
Excluded		4.6		75.0		85.3		88.2		92.8		33.7

[a]See the subsection on "The Independent Variable" in this appendix, below.

Reserve in order to separate, whereas no action was required on their part if they remained members.

INITIAL EXAMINATION OF THE DATA

Experiment participants responded somewhat differently to the reenlistment decision in the bonus and control areas. The percentage separating from the reserve was the same in both the bonus and control areas. However, those who reenlisted selected longer terms of service in the test than in the control areas. The first issue to be addressed with the follow-up data is whether or not the first-year (1978) differences in behavior carried over to the second year (1979).

For most individuals, the second-year decision is conceptually different from the first-year decision. In 1978, everyone selected to participate in the bonus test reached an ETS decision point; that is, he faced a normal administrative decision: whether to reenlist or separate. If he decided to reenlist, he then had to decide for how long. In the bonus areas, the length-of-term decision was further refined by a bonus-related decision. In 1979, on the other hand, only a portion of the bonus test participants reached an ETS decision point, namely, those who had selected a 1-year extension in 1978. The remainder of the population--those who had reenlisted--either continued to serve out their commitment in the reserve or had to make a negative administrative decision to terminate their commitment.

For individuals who selected the bonus, termination also implied giving up future yearly bonus payments and returning a portion of the initial bonus payment. The amount of the repayment is a function of the initial bonus ($900 or $1800) and the number of months served after receiving the initial payment. According to the contracts signed by bonus recipients, repayment is based on a simple calculation of $25 per month deducted from the initial payments. Consider, for example, an individual with an original ETS of January 1978 who reenlisted for 3 years but left the service in January 1979. He received an initial payment of $450, or 50 percent of the $900 bonus. He would be required to pay back $150 if he did not receive the first anniversary payment of $150 or $300 if he had received it.

Table D.3 shows differential second year behavior for individuals who reenlisted in the test and control areas, and within areas, by the first (1978) decision.

The first panel, consisting of those who separated during 1978, shows that approximately equal percentages, in both bonus and control areas and in both components, decided to reenter the reserve during 1979. This lack of differences is consistent with the findings related to the original 1978 decision. Since the bonus did not appear to influence individuals who separated, there is no reason to believe that the decision to reenter the reserve should be related to whether or not a bonus had been rejected in the initial decision.

The second panel, consisting of those who extended their terms for 1 year in 1978 and who therefore faced another ETS decision in 1979, shows definite differences between bonus and control groups. In the control areas, about two-thirds of this group extended again or reenlisted. Lacking information, we cannot determine the length of the term they selected in 1979. It appears, however, that most of them again extended for 1 year, indicating that they are making yearly decisions about reserve membership. In the bonus groups, a much smaller percentage of the 1978 1-year extenders remains in the reserve.

The second panel also highlights the large number of "unknowns." The original ETS dates of these unknowns suggest that they may have separated. A disproportionate number had original ETS dates between January and March 1978, suggesting that they may have extended early in 1978, separated during the same year, and therefore did not reach the 1979 ETS. Consequently, their loss records would have been processed during 1978 and they appear as unknowns in our 1979 data file. Personnel who are unsure of their plans will, on occasion, extend at ETS time and make their final decision at some later time. If a 1980 follow-up is conducted, it may be worthwhile to verify 1978 records to resolve the status of these unknown records.

The next two panels of Table D.3, those showing personnel who chose 3-year and 6-year terms, again indicate a difference in behavior between the bonus and control areas. In both cases, a high percentage remains in service. However, those who chose longer contracts and a

Table D.3

DECEMBER 1979 CLASSIFICATION BY 1978 STATUS FOR NATIONAL GUARD
AND ARMY RESERVE TEST AND CONTROL GROUPS

	Status at End of 1978							
	National Guard				Army Reserve			
	Bonus		Control		Bonus		Control	
Classification December 1979	N	%	N	%	N	%	N	%
Separated								
Member	115	4.2	198	4.6	48	5.9	62	4.6
Possible loss	31	1.0	58	1.3	8	1.0	8	0.6
Definite loss	2763	94.7	4048	94.1	760	93.1	1266	94.8
Unknown	0	0	0	0	0	0	0	0
Total	2763	99.0	4304	100.0	816	100.0	1336	100.0
One-Year Extension								
Member	173	53.1	1390	65.4	38	43.7	494	64.2
Possible loss	15	4.6	103	4.8	3	3.4	30	3.9
Definite loss	93	28.5	420	19.8	29	33.3	157	20.4
Unknown	45	13.8	213	10.0	17	19.5	88	11.4
Total	325	100.0	2126	100.0	87	100.0	769	100.0
Two-Year Extension								
Member	19		294	81.0	1		11	
Possible loss	--		2	.5	--		--	
Definite loss	4		49	13.5	--		3	
Unknown	2		18	5.0	1		5	
Total	25		363	100.0	2		19	
Three-Year Reenlistment								
Member	264	83.8	90	78.3	223	91.4	196	80.3
Possible loss	1	.3	4	3.5	2	0.8	3	1.2
Definite loss	33	10.5	12	10.4	17	7.0	41	16.8
Unknown	17	5.4	9	7.8	2	0.8	4	1.6
Total	315	100.0	115	100.0	244	100.0	244	99.9
Six-Year Reenlistment								
Member	804	88.3	33	76.7	436	92.4	21	72.4
Possible loss	2	0.3	4	9.3	5	1.0	1	3.4
Definite loss	70	7.7	4	9.3	23	4.9	4	13.8
Unknown	34	3.7	2	4.7	8	1.7	3	10.3
Total	911	100.0	43	100.0	472	100.0	29	100.0

bonus are more likely to be members in 1979 than those who did not
receive a bonus.

THE DEPENDENT VARIABLE

The classification of individuals presented in Table D.2, above,
allowed us to consider three alternative definitions of a dichotomous
dependent variable for the follow-up analysis (shown in Table D.4). The
forms of the variable differ in the manner in which the categories
"possible loss" and "unknown" are handled.

The first dependent variable classified the "possible loss" and
"unknowns" as actually having separated (labeled "unknown separated").
The second dependent variable classified them as members ("unknown
remaining"). The third definition of the dependent variable made no
assumptions about these two groups and simply excluded them from the
analysis ("unknown excluded").

In all three forms, the "member" classification is always
considered 1 and the "definite loss" classification is always 0. In
form 1, the "possible loss" and "unknown" classification groups are
assumed to be losses and are coded 0. In form 2, these groups are
assumed to be members and are coded 1. In form 3, these groups are
completely excluded. The analysis reported in Section IV used all three
forms.

Table D.4

ALTERNATIVE FORMS OF DEPENDENT VARIABLE FOR FOLLOW-UP ANALYSIS

Dependent Variable Form	Assumption	1979 Classification			
		Member	Possible Loss	Definite Loss	Unknown
1	Unknown separated	1	0	0	0
2	Unknown remaining	1	1	0	1
3	Unknown excluded	1	Excluded	0	Excluded

Appendix E
ASSIGNMENT OF DRAFT MOTIVATION STATUS

During the lottery draft period (1970-1973), individuals who received low lottery numbers could enlist in the reserve rather than be drafted. We expected these individuals to be less inclined to reenlist. It was thus important to assign a variable specifying an original draft pressure to each reservist. In this analysis, lottery numbers were used to determine the motivation of reserve personnel at entry.

Lottery numbers for the individuals in our sample were reconstructed by using birth dates given on the personnel records (RPMF) and data from the Selective Service random drawing. Lottery drawings were held annually from 1970 to 1973. Each drawing specified lottery numbers for a particular birth cohort; the first drawing, in 1970, included all men born between 1944 and 1950:

	Year of
Birth Year	Lottery Drawing
1944-1950	1970
1951	1971
1952	1972
1953	1973

Individuals received lottery numbers at age 18 and were eligible for the draft at age 19 for one year. Under certain conditions, an individual's eligibility period could be deferred for one year.

Among the personnel in our bonus test sample, only men who entered in 1972 could have been draft-motivated. Individuals who entered the reserve prior to 1972 were classified as nondraft-motivated. Since the length of the first term for males was 6 years, all of these people would have had the opportunity to reenlist at least once prior to the beginning of the test in 1978. Individuals in our sample who entered after 1972, the last draft year, were counted automatically as nondraft-motivated. Only personnel who entered in 1972 would have been

subject to the draft at enlistment and have faced a first reenlistment decision in 1978.

The 1972 accession group, however, contained not only personnel born in 1952, but also some who had received lottery numbers in other drawings. Many who received lottery numbers in 1970 and 1971 had deferred their eligibility until 1972. In addition, some reservists born in 1953 entered in 1972 after the 1973 lottery numbers had been announced. To match lottery numbers to birth dates, it was first necessary to determine the appropriate lottery drawing from which the individual received a number (see Tables E.1 to E.4), based on his birth year.

Table E.1

1970 DRAFT CALL NUMBERS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	305	86	108	32	330	249	93	111	225	359	19	129
2	159	144	29	271	298	228	350	45	161	125	34	328
3	251	297	267	83	40	301	115	261	49	244	348	157
4	215	210	275	81	276	20	279	145	232	202	266	165
5	101	214	293	269	364	28	188	54	82	24	310	56
6	224	347	139	253	155	110	327	114	6	87	76	10
7	306	91	122	147	35	85	50	168	8	234	51	12
8	199	181	213	312	321	366	13	48	184	283	97	105
9	194	338	317	219	197	335	277	106	263	342	80	43
10	325	216	323	218	65	206	284	21	71	220	282	41
11	329	150	136	14	37	134	248	324	158	237	46	39
12	221	68	300	346	133	272	15	142	242	72	66	314
13	318	152	259	124	295	69	42	307	175	138	126	163
14	238	4	354	231	178	356	331	198	1	294	127	26
15	17	89	169	273	130	180	322	102	113	171	131	320
16	121	212	166	148	55	274	120	44	207	254	107	96
17	235	189	33	260	112	73	98	154	255	288	143	304
18	140	292	332	90	278	341	190	141	246	5	146	128
19	58	25	200	336	75	104	227	311	177	241	203	240
20	280	302	239	345	183	360	187	344	63	192	185	135
21	186	363	334	62	250	60	27	291	204	243	156	70
22	337	290	265	316	326	247	153	339	160	117	9	53
23	118	57	256	252	319	109	172	116	119	201	182	162
24	59	236	258	2	31	358	23	36	195	196	230	95
25	52	179	343	351	361	137	67	286	149	176	132	84
26	92	365	170	340	357	22	303	245	18	7	309	173
27	355	205	268	74	296	64	289	352	233	264	47	78
28	77	299	223	262	308	222	88	167	257	94	281	123
29	349	285	362	191	226	353	270	61	151	229	99	16
30	164	999	217	208	103	209	287	333	315	38	174	3
31	211	999	30	999	313	999	193	11	999	79	999	100

Table E.2

1971 DRAFT CALL NUMBERS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	133	335	14	224	179	65	104	326	283	306	243	347
2	195	354	77	216	96	304	322	102	161	191	205	321
3	336	186	207	297	171	135	30	279	183	134	294	110
4	99	94	117	37	240	42	59	300	231	266	39	305
5	33	97	299	124	301	233	287	64	295	166	286	27
6	285	16	296	312	268	153	164	251	21	78	245	198
7	159	25	141	142	29	169	365	263	265	131	72	162
8	116	127	79	267	105	7	106	49	108	45	119	323
9	53	187	278	223	357	352	1	125	313	302	176	114
10	101	46	150	165	146	76	158	359	130	160	63	204
11	144	227	317	178	293	355	174	230	288	84	123	73
12	152	262	24	89	210	51	257	320	314	70	255	19
13	330	13	241	143	353	342	349	58	238	92	272	151
14	71	260	12	202	40	363	156	103	247	115	11	348
15	75	201	157	182	344	276	273	270	291	310	362	87
16	136	334	258	31	175	229	284	329	139	34	197	41
17	54	345	220	264	212	289	341	343	200	290	6	315
18	185	337	319	138	180	214	90	109	333	340	280	208
19	188	331	189	62	155	163	316	83	228	74	252	249
20	211	20	170	118	242	43	120	69	261	196	98	218
21	129	213	246	8	225	113	356	50	68	5	35	181
22	132	271	269	256	199	307	282	250	88	36	253	194
23	48	351	281	292	222	44	172	10	206	339	193	219
24	177	226	203	244	22	236	360	274	237	149	81	2
25	57	325	298	328	26	327	3	364	107	17	23	361
26	140	86	121	137	148	308	47	91	93	184	52	80
27	173	66	254	235	122	55	85	232	338	318	168	239
28	346	234	95	82	9	215	190	248	309	28	324	128
29	277	999	147	111	61	154	4	32	303	259	100	145
30	112	999	56	358	209	217	15	167	18	332	67	192
31	60	999	38	999	350	999	221	275	999	311	999	126

Table E.3

1972 DRAFT CALL NUMBERS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	207	306	364	096	154	274	284	180	302	071	366	038
2	225	028	184	129	261	363	061	326	070	076	190	099
3	246	250	170	262	177	054	103	176	321	144	300	040
4	264	092	283	158	137	187	142	272	032	066	166	001
5	265	233	172	294	041	078	286	063	147	339	211	252
6	242	148	327	297	050	218	185	155	110	006	186	356
7	292	304	149	058	106	288	354	355	042	080	017	141
8	287	208	229	035	216	084	320	157	043	317	260	065
9	338	130	077	289	311	140	022	153	199	254	237	027
10	231	276	360	194	220	226	234	025	046	312	227	362
11	090	351	332	324	107	202	223	034	329	201	244	056
12	228	340	258	165	052	273	169	269	308	257	259	249
13	183	118	173	271	105	047	278	365	094	236	247	204
14	285	064	203	248	267	113	307	309	253	036	316	275
15	325	214	319	222	162	008	088	020	303	075	318	003
16	074	353	347	023	205	068	291	358	243	159	120	128
17	009	198	117	251	270	193	182	295	178	188	298	293
18	051	189	168	139	085	102	131	011	104	134	175	073
19	195	210	053	049	055	044	100	150	255	163	333	019
20	310	086	200	039	119	030	095	115	313	331	125	221
21	206	015	280	342	012	296	067	033	016	282	330	341
22	108	013	345	126	164	059	132	082	145	263	093	156
23	349	116	089	179	197	336	151	143	323	152	181	171
24	337	359	133	021	060	328	004	256	277	212	062	245
25	002	335	219	238	024	213	121	192	224	138	097	135
26	114	136	122	045	026	316	350	348	344	069	209	361
27	072	217	232	124	241	007	235	352	314	098	240	290
28	357	083	215	281	091	057	127	037	005	010	031	174
29	266	305	343	109	081	196	146	279	048	079	230	101
30	268		191	029	301	123	112	334	299	087	014	167
31	239		161		018		315	111		160		322

Table E.4

1973 DRAFT CALL NUMBERS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	150	112	203	012	058	015	039	323	219	215	107	170
2	328	278	322	108	275	360	297	027	017	128	214	090
3	042	054	220	104	166	245	109	003	226	103	232	056
4	028	068	047	280	172	207	092	313	356	079	339	250
5	338	096	266	254	292	230	139	063	354	086	223	031
6	036	271	001	088	337	087	132	208	173	041	211	336
7	111	154	002	163	145	251	285	057	144	129	299	267
8	206	347	153	050	201	282	355	131	097	157	312	210
9	197	136	321	234	276	083	179	007	364	116	151	120
10	037	361	331	272	100	178	089	249	217	342	257	073
11	174	026	239	350	307	064	202	125	334	319	159	082
12	126	195	044	023	115	190	340	198	043	171	066	085
13	298	263	244	169	049	318	306	329	229	269	124	335
14	341	348	117	081	224	095	305	205	353	014	237	038
15	221	308	152	343	165	016	359	241	235	277	176	137
16	309	227	094	119	101	032	074	019	225	059	209	187
17	231	046	363	183	273	091	199	008	189	177	284	294
18	072	011	357	242	098	238	121	113	289	192	160	013
19	303	127	358	158	148	052	332	105	228	167	270	168
20	161	106	262	314	274	077	033	162	141	352	301	149
21	099	316	300	004	310	315	005	030	123	288	287	080
22	259	020	317	264	333	146	286	140	268	191	102	188
23	258	247	022	279	216	212	365	302	296	193	320	252
24	062	261	071	362	246	061	324	138	236	256	180	155
25	243	260	065	255	122	143	035	290	291	009	025	006
26	311	051	024	233	118	345	204	076	029	078	344	351
27	110	186	181	265	293	330	060	034	248	325	135	194
28	304	295	045	055	018	053	185	040	070	327	130	156
29	283		021	093	133	075	282	084	196	349	147	175
30	114		213	069	048	142	200	182	184	346	134	281
31	240		326		067		253	218		010		164

The resulting distribution of the frequency of lottery numbers for our sample is shown in Table E.5 and Fig. E.1. The data confirm the presence of strong draft motivation to enlist among this group of reservists. For lottery numbers at or below 95, the average number of reservists per lottery number is 69.68, ranging from 47 to 99. For lottery numbers above 95, the average number of reservists per lottery number is 3.04 ranging from 0 to 15.

The Selective Service announced in 1972 that draft boards would not draft eligible men with lottery numbers above 95. From this distribution it is clear that the vast majority of reservists with lottery numbers at or below 95 were, indeed, draft-motivated to enlist. However, since lottery numbers were assigned randomly, one would expect the same number of volunteers with low lottery numbers as high lottery numbers. Thus, while persons with high lottery numbers could be uniquely assigned nondraft-motivated status, low lottery number personnel could not be uniquely identified, although a high proportion could be assigned as draft-motivated. For our analysis, those having a lottery number greater than 95 were assigned a zero, i.e., characterized as nondraft-motivated, while those with a lottery number of 95 or below were assigned a 1, i.e., characterized as draft-motivated.

Table E.5

FREQUENCY OF LOTTERY NUMBERS FOR
1972 MALE ENTRANTS IN SAMPLE

| LOTT	FREQ	LOTT	FREQ	LOTT	FREQ	LOTT	FREQ	LOTT	FREQ	LOTT	FREQ
1	71	67	89	133	2	199	2	265	2	331	2
2	67	68	79	134	6	200	1	266	5	332	2
3	91	69	86	135	3	201	1	267	4	333	2
4	82	70	73	136	2	202	1	268	0	334	1
5	77	71	78	137	2	203	0	269	2	335	2
6	71	72	59	138	0	204	3	270	3	336	2
7	86	73	78	139	3	205	0	271	0	337	3
8	65	74	86	140	2	206	2	272	2	338	0
9	69	75	99	141	4	207	5	273	1	339	1
10	68	76	73	142	5	208	3	274	1	340	1
11	71	77	59	143	4	209	2	275	4	341	1
12	70	78	86	144	11	210	1	276	2	342	2
13	61	79	71	145	3	211	0	277	2	343	4
14	63	80	67	146	1	212	2	278	6	344	1
15	66	81	59	147	6	213	2	279	1	345	1
16	66	82	72	148	1	214	2	280	3	346	1
17	47	83	61	149	4	215	5	281	2	347	2
18	68	84	61	150	3	216	5	282	3	348	2
19	67	85	72	151	4	217	2	283	4	349	2
20	59	86	73	152	1	218	2	284	1	350	6
21	64	87	70	153	5	219	2	285	5	351	3
22	59	88	78	154	5	220	6	286	1	352	2
23	56	89	71	155	3	221	5	287	4	353	1
24	52	90	72	156	0	222	0	288	3	354	5
25	62	91	78	157	4	223	2	289	0	355	4
26	79	92	75	158	4	224	2	290	3	356	3
27	55	93	77	159	3	225	3	291	3	357	2
28	68	94	56	160	5	226	2	292	5	358	2
29	54	95	69	161	3	227	4	293	1	359	2
30	52	96	15	162	3	228	0	294	1	360	3
31	70	97	12	163	3	229	4	295	2	361	3
32	54	98	10	164	2	230	0	296	5	362	1
33	61	99	9	165	2	231	1	297	1	363	1
34	73	100	10	166	3	232	1	298	1	364	6
35	56	101	4	167	2	233	1	299	6	365	3
36	62	102	3	168	6	234	3	300	2	366	3
37	80	103	6	169	4	235	2	301	4	TOTAL	7444
38	69	104	10	170	5	236	2	302	0		
39	78	105	3	171	1	237	1	303	4		
40	72	106	5	172	3	238	3	304	4		
41	67	107	6	173	1	239	1	305	2		
42	50	108	3	174	1	240	4	306	2		
43	93	109	7	175	2	241	1	307	2		
44	56	110	4	176	4	242	2	308	4		
45	64	111	5	177	4	243	2	309	1		
46	66	112	6	178	4	244	4	310	1		
47	68	113	5	179	4	245	1	311	6		
48	64	114	5	180	3	246	1	312	3		
49	52	115	6	181	2	247	0	313	2		
50	58	116	2	182	2	248	1	314	2		
51	71	117	2	183	1	249	6	315	1		
52	66	118	4	184	5	250	6	316	1		
53	66	119	5	185	5	251	6	317	1		
54	79	120	6	186	4	252	6	318	2		
55	74	121	3	187	2	253	2	319	2		
56	82	122	5	188	3	254	2	320	3		
57	71	123	9	189	2	255	0	321	3		
58	65	124	4	190	6	256	4	322	5		
59	62	125	5	191	1	257	3	323	3		
60	67	126	3	192	0	258	6	324	3		
61	74	127	2	193	4	259	7	325	3		
62	88	128	6	194	2	260	5	326	2		
63	95	129	3	195	3	261	2	327	4		
64	82	130	4	196	3	262	2	328	2		
65	76	131	2	197	3	263	1	329	4		
66	76	132	4	198	2	264	1	330	4		
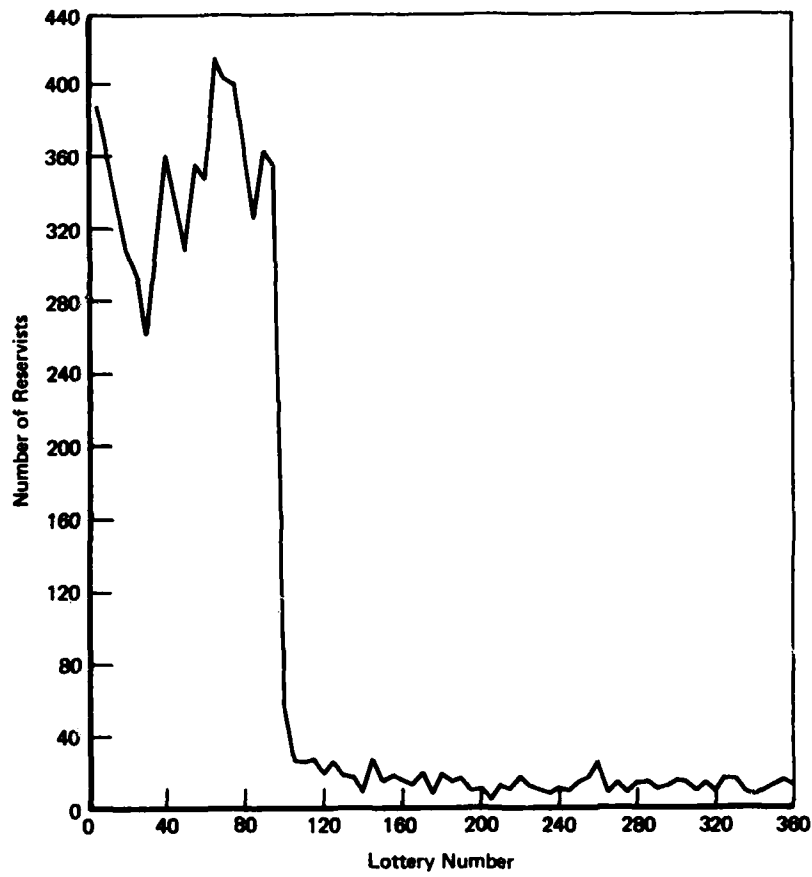
Fig. E.1—Distribution of lottery numbers for guardsmen
and reservists who entered in 1972

Appendix F

DEFINITIONS AND ASSUMPTIONS OF VARIABLES

Table 6 in Section III described the codes assigned to the
variables used in this study. Various assumptions were made to derive
the appropriate value for individuals on the basis of available data.
This a, pendix describes the sources of the data and the assumptions made
in order to assign values.

Two sources of data were used to define the variables: the
administrative data file, containing data from both the Initial
Eligibility Roster (IER) and the Reserve Personnel Master Files (RPMF),
and survey data collected from participants in both bonus and control
areas. In general, IER data were used where available and within range,
because they were most current. In some cases, where the value was
missing or out of range, a value was used from the RPMF or the survey
data, as described below. Included in this appendix are definitions of
the variables used and the assumptions needed to calculate their values.
The variables are organized into four groups: independent,
experimental, demographic, and military experience.

INDEPENDENT VARIABLES

Reenlistment (REUP): The reservist chose to extend (or reenlist)
for at least 1 year or to separate. A reservist who initially
reenlisted but separated before the end of the experimental year (1978)
was considered to have separated (4 guardsmen and 2 reservists were so
coded).

Reenlistment for 3 or 6 years (REUP36): The reservist chose to
reenlist for 3 to 6 years rather than for none or 1. A reservist who
reenlisted for 2 years would have chosen 1 year had there been only 1-,
3-, and 6-year options; therefore these cases (203 guardsmen and 6
reservists) were coded as 1 year.

Reenlistment for 6 years (REUP6): The reservist chose to
reenlist for 6 rather than 3 years. The one guardsman who is indicated

in the monitoring system as having reenlisted for 5 years was coded as having actually reenlisted for 6 years.

EXPERIMENTAL VARIABLES

Treatment (TREAT): The reservist was in a state or Army command in which a bonus was offered for 3- or 6-year enlistments, rather than in a control group.

DEMOGRAPHIC VARIABLES

Year of Birth (YOB): Eligible reservists must have been born between 1935 and 1958. Survey data were used to correct administrative birth years that were out of range, missing, or inverted.

Race (RACE): Black or nonblack; the twelve categorical ethnic minorities on personnel (RPMF) records were considered nonblack.

Education (EDUC): High school graduate or less or at least some college education.

Dependents (DEP): Number of dependents.

Marital Status (MSTAT) : Single or married.

Sex (SEX): Male or female.

MILITARY EXPERIENCE VARIABLES

Pay Grade (PGR): E1 to E7. If pay grade was missing from the initial eligibility roster, pay grade from the Reserve Personnel Master Files was used.

Motivation (MOTIV): Motivation of the most recent enlistment was or was not to avoid being drafted (see Appendix E for lottery number analysis). The following assumptions were made:

- The only reservists whose current enlistment could have been motivated by the desire to avoid being drafted are males entering in 1972.
- Males entering the reserve in 1972 and born between 1944 and 1950 had 1970 lottery numbers and deferments at least until 1972.

- Males entering the reserve in 1972 and born in 1951 had 1971 lottery numbers and deferments at least until 1972.
- Males entering the reserve in 1972 and born in 1952 had 1972 lottery numbers.
- Males entering the reserve between February and December 1972 and born in 1953 had 1973 lottery numbers (announced in February 1972).
- Males entering the reserve in 1972 and born between 1944 and 1952 or entering after January 1972, born in 1953, and holding a lottery number of 95 or less were motivated to join the reserve to avoid the draft. Reservists with higher lottery numbers were not draft-motivated.

Combat MOS (COMB): Primary MOS is or is not combat-related. The first two digits of the MOS code (11, 12, and 13) indicate whether the MOS is combat-related. If either the primary MOS from the survey or the MOS from the initial eligibility roster indicates a combat-related MOS, then the reservist was considered in a combat MOS. Women cannot have combat MOSs; therefore, women were coded as having non-combat MOSs.

First-Term Male (1TM): The reservist is or is not a male in his first term. This variable is based on the year the reservist entered. First-term reservists entered in 1972 or 1975. Entry year has a possible range between 1970 and 1975. Pay Entry Base Date (PEBD) from the initial eligibility roster was used if in range; otherwise, the Reserve Personnel Master Files (RPMF) were used. If both were out of range, the total years of service was used.

Length of First Term (LTRM): The length of the initial enlistment term. Reservists entering between 1970 and 1972 initially enlisted for a 6-year term; those entering between 1973 and 1975 initially enlisted for a 3-year term.

Component (COMP): National Guard or Army Reserve.

First Term (1STTRM): The current term is or is not a first term. Reservists entering in 1972 or 1975 are in their first term. Reservists entering in 1970, 1971, 1973 or 1974 are in their second or later terms (careerists).

Appendix G

COMPARISON OF INDIVIDUAL CHARACTERISTICS OF NATIONAL GUARD
AND ARMY RESERVE SAMPLE MEMBERS

Section IV discussed the differences in the demographic
characteristics of the bonus and control groups, without specific
attention to differences between the National Guard and Army Reserve
samples. This appendix compares components on the basis of the means
of the demographic characteristic, as shown in Table G.1, and the
relationship between the length of the first term and type of current
term, as shown in Table G.2. The variables are defined in Table 6,
Section III.

Table G.1

MEANS OF NATIONAL GUARD AND ARMY RESERVE SAMPLES
FOR VARIABLES IN THE REENLISTMENT MODEL

	National Guard	Army Reserve
Treatment	.42	.40
Demographic		
Year of birth	50.94	50.49
Race	.07	.09
Education	.35	.46
Dependents	1.06	.94
Marital status	.62	.54
Sex	.06	.31
Military Experience		
Pay grade	4.43	4.60
Motivation	.45	.38
Combat MOS	.37	.11
First-term males	.59	.44
Length of first term	.90	.67
First term	.63	.66
Number	11,292	4021

Table G.2

CURRENT TERM BY LENGTH OF FIRST TERM AND BY SEX
FOR THE NATIONAL GUARD AND ARMY RESERVE

Length of 1st Term	Current Enlistment Term	National Guard				Army Reserve			
		Male		Female		Male		Female	
		N	%	N	%	N	%	N	%
3 years	First	117	1.2	469	74.6	48	1.7	863	70.6
	Career	291	3.0	153	24.3	32	1.2	354	28.9
6 years	First	5933	61.7	6	1.0	1727	62.8	3	0.2
	Career	3279	34.1	1	0.1	941	34.3	4	0.3
Total		9620	100.0	629	100.0	2748	100.0	1224	100.0

TREATMENT DIFFERENCES

There were roughly the same percentages of bonus participants in both components, 42 percent in the National Guard and 40 percent in the Army Reserve.

DEMOGRAPHIC DIFFERENCES

The National Guard tends to have younger, less educated participants, more of whom are married and have more dependents, fewer blacks, and far fewer women than the Army Reserve. Women constitute only 6 percent of the National Guard, but 31 percent of the Army Reserve. The percentage of women in the guard sample is below that in the active force, whereas in the Army Reserve sample it is far above current active force levels.

MILITARY EXPERIENCE DIFFERENCES

The National Guard and the Army Reserve also differ in their military experience. Guardsmen average slightly lower pay grades than

Army reservists. A large percentage (43 percent) of the total study population was initially motivated by the draft to join the reserve. These are all first-term males, since the motivation of career males to reenlist in their most recent term was not to avoid being drafted (see Appendix E). The draft motivated 45 percent of National Guardsmen, but only 38 percent of Army reservists to join. The lower percentage in the Army Reserve represents the presence of more women in that component, i.e., individuals not subject to the draft.

The primary military occupational specialty describes the kind of job the reservist is trained to do and would likely do if mobilized. Those with combat-related MOSs may have chosen to train in those specialties or they may have had to accept them because the only available units to join were combat-related. The National Guard has many more combat units than the Army Reserve. Furthermore, women cannot participate in combat-related MOSs. As a result, the percentage of such MOSs in the Army Reserve (11 percent) is much smaller than that in the National Guard (37 percent).

As mentioned in Section IV, preliminary analyses indicated that first-term males reenlist at different rates from other sex and term groupings. Since they comprise over 50 percent of the study population (59 percent in the National Guard and 44 percent in the Army Reserve), it is important to distinguish them from all others if their reenlistment rates differ.

The National Guard sample had 10 percent of the total initially obligated for 3 years, while the Army Reserve had 33 percent. Roughly 64 percent of the members of both components (63 percent in ARNG and 66 percent in USAR) are in their first enlistment term. Women in the reserve have the option of initially enlisting for a 3-year term instead of the usual 6-year term for men. There have also been special programs in which men were encouraged to enlist, with the option of modifying the 6-year obligation to 3 years. Table G.2 shows, by component and sex, the relationship between the length of the first term and type of current enlistment term. Of the men whose initial obligation was for 6 years, roughly twice as many from both components are first termers

rather than careerists. This is also the case for the few men in the Army Reserve who had initial 3-year terms. In the National Guard, most of the men who had initial 3-year terms have extended at least once. The pattern for the women is quite different. Virtually no women enlisted for 6-year terms. In the National Guard, over 3 times as many women are in their first term as are in a reenlistment term; in the Army Reserve, over twice as many.

Appendix H
SUPPLEMENTARY REENLISTMENT DECISION TABLES

As discussed in Section IV, the pattern of reenlistments differs among first-term males and other reservists. Among the first-term personnel, draft-motivated reservists behave differently from nondraft-motivated reservists. Table H.1 shows the reenlistment decisions made during the 1978 bonus test in the National Guard and Army Reserve. The table separates males and females, draft-motivated and nondraft-motivated reservists, and first-term reservists and careerists. In each subgroup, the pattern of reenlistment decisions is similar in the National Guard and Army Reserve. In each subgroup, the majority of those who did not separate chose 1-year extensions in the control group, but 3- or 6-year reenlistments in the bonus group. Female first-term reservists, female careerists, and male careerists show a similar pattern. The percentage of those who separate is higher among nondraft-motivated first-term males and even higher among draft-motivated males.

Table H.1

REENLISTMENT DECISIONS IN THE NATIONAL GUARD AND ARMY RESERVE
OF BONUS AND CONTROL GROUPS, BY SEX, CURRENT TERM OF
ENLISTMENT, AND DRAFT MOTIVATION

Reenlistment Decision by Sex	First Term								Career			
	Draft-Motivated				Nondraft-Motivated							
	Control		Bonus		Control		Bonus		Control		Bonus	
	N	%	N	%	N	%	N	%	N	%	N	%
Army National Guard												
Males												
Separate	2134	80	1596	79	475	65	416	67	1052	46	572	44
1 year	521	19	109	5	232	32	36	6	1194	52	178	14
3 years	15	1	92	5	18	2	40	6	46	2	125	10
6 years	11	0	233	11	8	1	132	21	14	1	435	33
Total	2681	100	2030	100	733	100	624	100	2306	101	1310	101
Females												
Separate					87	42	139	52	31	44	29	35
1 year					103	49	16	6	39	55	9	11
3 years					13	6	42	16	1	1	13	16
6 years					6	3	70	26	0	0	33	39
Total					209	100	267	100	71	100	84	101
Army Reserve												
Males												
Separate	761	77	421	75	99	65	51	59	182	34	170	37
1 year	172	18	26	5	41	27	3	3	260	49	42	9
3 years	43	4	39	7	13	9	9	10	83	16	87	19
6 years	6	1	75	13	0	0	24	28	11	2	157	34
Total	982	100	561	100	153	101	87	100	536	101	456	99
Females												
Separate					220	45	135	35	74	31	39	32
1 year					204	42	14	4	111	46	4	3
3 years					55	11	83	21	50	21	25	20
6 years					8	2	159	41	4	2	56	45
Total					487	100	391	101	239	100	124	100

Appendix I

CORRELATIONS BETWEEN VARIABLES

Table I.1 shows the correlation matrix of all independent variables used in this study and of the dependent variable REUP (whether the reservist chose to separate or remain in service). All correlations above .20 are discussed below. The sign of the correlation depends on the particular coding of the variable (see Table 6); this appendix will clarify the direction of the relationship.

Correlation of REUP with Other Variables. REUP is negatively correlated with motivation and with first-term male ($r = -.32$ and $-.33$, respectively), indicating that draft-motivated males and first-term males in general reenlist less frequently than others. These correlations are not independent, since only first-term males could possibly be draft-motivated, and in fact most are so ($r = .79$ between motivation and first-term male).

Correlation of Treatment with Other Variables. The correlation coefficients between the treatment and each of the other variables are low, the highest being only $-.09$ with marital status. As mentioned in Section IV, however, several differences between the bonus and control groups were significant.

Correlation among Demographic Variables. As one would expect, marital status is highly correlated with number of dependents ($r = .68$); generally unmarried people have no dependents and married people have at least one. The number of dependents is also highly correlated with year of birth ($r = -.37$); older reservists have more dependents. Three other correlations between demographic variables are above .20. Older reservists have had more education than younger reservists ($r = -.22$), and women reservists tend to be black ($r = .29$) and single ($r = -.27$).

Correlations between Demographic Variables and Military Experience. Because women and men enter the reserve with differing initial term lengths and because women's roles in the reserves are somewhat restricted, several correlations between sex and military experience variables are large. Generally, women initially enlist for

Table I.1

CORRELATION MATRIX OF VARIABLES USED IN THIS STUDY

	REUP	TREAT	YOB	RACE	EDUC	DEP	MSTAT	SEX	PGR	MOTIV	COMB	1TM	LTRM	COMP	1STTRM
REUP	1.00														
TREAT	.003	1.00													
YOB	-.15	.02	1.00												
RACE	.10	-.03	-.06	1.00											
EDUC	-.03	.06	-.22	-.08	1.00										
DEP	.10	-.06	-.37	-.03	-.04	1.00									
MSTAT	.03	-.09	-.18	-.12	.003	.68	1.00								
SEX	.15	.05	.03	.29	-.07	-.17	-.27	1.00							
PGR	.17	.03	-.16	-.17	.21	.11	.16	-.12	1.00						
MOTIV	-.32	.004	.16	-.17	.14	-.13	.004	-.33	-.06	1.00					
COMB	-.07	-.01	.01	-.06	-.05	.07	.07	-.25	.01	.05	1.00				
1TM	-.33	.007	.26	-.14	.02	-.14	-.01	-.42	-.16	.79	.10	1.00			
LTRM	-.16	-.04	-.05	-.31	.11	.15	.27	-.86	.18	.38	.21	.42	1.00		
COMP	.08	.02	-.06	.04	.10	-.05	-.07	.33	.09	-.06	-.26	-.13	-.28	1.00	
1STTRM	-.28	.04	.32	.01	-.02	-.24	-.15	.06	-.26	.65	-.02	.83	.002	.03	1.00

3-year terms (r = -.86), and they cannot serve in combat-related MOSs (r = -.25). Also, women represent a larger percentage of the Army Reserve than of the National Guard (r = .33). Several other correlation coefficients are above .20. First-term males are younger (r = .26), as are first-term reservists in general (r = .32). Those who initially enlist for short terms tend to be black (r = -.31), owing perhaps to the larger representation of black women, and tend to be single (r = .27). Reservists with at least some college tend to be in higher pay grades (r = .21). Lastly, those in their first term have fewer dependents than those who have previously reenlisted (r = -.24).

Correlations among Military Experience Variables. As mentioned above, only first-term males can be draft-motivated (r = .79). In addition, males who entered for 3-year terms in 1973-1975 entered after the draft ended and were thus not draft-motivated. Thus, length of first term is also correlated with motivation (r = .38). Similarly, length of first term is correlated with first-term male (r = .42) and with combat MOS (r = .21), since women are not first-term males and cannot have combat MOSs. First term is very highly correlated with motivation, since no reservist who reenlisted at least once could be draft-motivated (r = .65). First-term males are a subset of all first-term reservists, and it follows that the correlation between first-term male and first term is high (r = .83). Reservists in their first term are in lower pay grades than those who have reenlisted at least once (r = -.26). Since there are a larger percentage of females in the Army Reserve, combat MOSs and long first terms occur proportionately less frequently in the Army Reserves than in the National Guard (r = -.26 and -.28, respectively).

Appendix J
INTERACTION TERM ANALYSIS

The discussion in Section IV indicated that beyond chance levels there were no significant differential effects by subgroups in their response to the bonus. This appendix describes one of the analyses from which those conclusions were drawn, namely, that applicable to Model 1. Similar analyses conducted for Models 2 and 3 led to similar findings.

Two OLS models of separation were developed. The first includes only main effects; the second adds terms for which the treatment interacts with a main effect to produce different responses to the treatment, depending on the level of the main variable. For example, if males respond favorably to the bonus offer, but females do not, then a sex by treatment interaction effect would be observed. The results are shown in Table J.1. Only one of the 13 interactions was significantly different from zero, namely, race by treatment. Using coefficients for treatment, race, and race by treatment, we found the retention rate of blacks to be 15 percent higher than that of nonblacks in the control group, but only 5 percent higher in the bonus group. However, since many interaction effects were tested, this observation may be due to chance alone.

Table J.1

OLS MODELS OF SEPARATION WITH AND WITHOUT INTERACTIONS (a)

	Regression Coefficients	
Variable	Without Interactions	With Interactions
Constant	0.68	0.69
Treatment	0.004	-0.03
Demographic		
Year of birth	-0.01(b)	-0.01(b)
Race	0.11(b)	0.15(b)
Education	-0.05(b)	-0.05(b)
Dependents	0.02(b)	0.01
Marital status	-0.01	0.004
Sex	0.02	0.02
Military experience		
Pay grade	0.09(b)	0.09(b)
Motivation	-0.14(b)	-0.14(b)
Combat MOS	-0.04(b)	-0.04(b)
First-term males	-0.11(b)	-0.11(b)
Length first term	-0.06(b)	-0.03
Component	0.02	0.01
First term	-0.03	-0.03
Interactions of treatment with:		
Year of birth	---	---
Race	---	-0.10(b)
Education	---	---
Dependents	---	0.01
Marital status	---	-0.04
Sex	---	---
Pay-grade	---	0.01
Motivation	---	---
Combat MOS	---	0.16
First-term males	---	---
Length first term	---	-0.03
Component	---	0.03
First term	---	---
R^2	.15	.15
N	15,132	15,132

(a) South Carolina included.
(b) Significant at 1 percent.

Appendix K
TESTING FOR EFFECTS OF REGION-SPECIFIC VARIABLES

A SEPARATION MODEL INCLUDING REGIONAL DUMMIES

In addition to the separation model described in Section IV, we estimated a second model that included all of the characteristics of the individual-level model but also allowed an assessment of region-specific effects. These effects are included through a series of dummy variables--one for each state or region included in the test design. These regional dummies can be thought of as representing some underlying regional characteristics which are not identified in the first model. Through analysis of the coefficients of these dummy variables, certain assumptions critical to the test design and integrity can be tested. One such assumption is the equivalence of reenlistment rates in each pair of matched regions prior to the test. If there were a large mismatch on one or two regions, these might have dominated test results. Another assumption is that no regional administrative differences during the test affected the test results. For instance, one bonus region may have successfully mounted unusual efforts to boost retention during the bonus, and results may have been unduly influenced by such a region. Thus, uniformity of test results across matched regions will strengthen confidence in test results, while extreme nonuniformity will weaken confidence in these results.

The separation model was extended to include 21 additional variables. Each of the twelve states and nine ARCOMs was indicated by a dichotomous variable and the bonus dummy and component dummy were omitted from the model. An analysis of variance (ANOVA)[1] performed on the dummy regression coefficients will be used to determine the effect of the bonus offer and component on retention.

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[1] For a discussion of this technique, see J. E. Rolph, A. P. Williams, and C. L. Lee, "The Effect of State of Residence on Medical School Admissions: Empirical Bayes and Least Squares Discriminant Estimators," Proceedings of the American Statistical Association, 1978.

Table K.1

COMPARISON OF TWO SEPARATION DECISION MODELS

Variable	Individual Characteristics		Regional Effects Model		Regional Differences
	Coefficient	t-Ratio	Coefficient	t-Ratio	
Constant	9.45		(a)		
Treatment	.11	2.77(b)	(a)		
Demographic					
Year of birth	-.04	-6.42(b)	-.04	-6.20(b)	
Race	.39	5.17(b)	.36	4.61(b)	
Education	-.21	-4.97(b)	-.21	-4.91(b)	
Dependents	.09	3.75(b)	.11	4.29(b)	
Marital status	-.12	-2.12(c)	-.12	-2.13(c)	
Sex	.05	.33	.08	.57	
Military experience					
Pay grade	-.47	18.07(b)	.47	18.02(b)	
Motivation	-.72	-11.11(b)	-.74	-11.30(b)	
Combat MOS	-.19	-4.37(b)	-.18	-3.97(b)	
First-term males	-.45	-3.50(b)	-.42	-3.23(b)	
Length of first term	-.33	-3.30(b)	-.33	-3.23(b)	
Component	.12	2.62(b)	(a)		
First term	-.13	-1.13	-.14	-1.22	
Regional					
Unemployment	.08	5.17(b)	.08	1.21	
Per capita income	-1.06	-4.22(b)	-.54	-.95	
Regional dummies					
Kansas (bonus)			4.61	.90	
Iowa (control)			4.44	.87	.17
New Jersey (bonus)			4.80	.92	
New York (control)			4.58	.88	.22
Michigan (bonus)			4.86	.93	
Pennsylvania (control)			4.69	.91	.16
Georgia (bonus)			4.68	.93	
North Carolina (control)			5.00	1.00	-.32
North Dakota (bonus)			4.93	.97	
Idaho (control)			4.66	.92	.27
Oregon (bonus)			4.48	.87	
Washington (control)			4.46	.86	.02
76th Tng Div (bonus)			5.11	.99	
94th ARCOM (bonus)			5.00	.98	
79th ARCOM (control)			4.75	.93	
99th ARCOM (control)			4.73	.93	.32(d)
96th ARCOM (bonus)			4.81	.96	
89th ARCOM (control)			4.89	.96	-.07
205th Inf Bde (bonus)			4.79	.94	
187th Inf Bde (bonus)			4.96	.97	
157th Inf Bde (control)			4.65	.91	.23(d)
Number	14,221		14,221		
Log likelihood ratio	1184(e)		1213(e)		

(a) Variable not present in model.
(b) Significant at 1 percent.
(c) Significant at 5 percent.
(d) Difference is average of bonus areas less average of control areas.
(e) Significant at .1 percent.

The results of the regional level logit analysis together with the original model are shown in Table K.1. A chi-square[2] test indicates that the use of regional dummy variables significantly contributes to the explanatory power of the model.

The coefficients on all demographic and military experience variables showed little change with the addition of the regional dummies, and the significance levels for these variables included in both models remained the same. However, the two regional characteristics are no longer statistically significant--indicating a not unexpected interaction between the regional dummies and economic climate variables--but their magnitude is not substantially different for the two models.

Examination of the magnitude of the regional dummy coefficients for the National Guard show that in 5 of 6 matched pairs, the bonus state has a larger coefficient than the control state. Only for North Carolina and Georgia did the control state coefficient exceed the bonus state. One interpretation of this difference in coefficients (shown in column 5) is as a bonus effect in each region. Interpreted in this way, the bonus had a positive effect in 5 of 6 matched states. For the reserve, the comparisons show positive bonus effects in two out of three matched regions. Moreover, the magnitude of the differences show no highly unusual outlier that is affecting the results. The most extreme point is the difference of -.32 for North Carolina and Georgia. Dropping this point from the analysis changes the estimated bonus effect by only 2 to 3 percentage points. Clearly, the results are not dominated by any one pair of points.

In the first model, large regions contribute more to the estimation of treatment effects than small regions, simply because there are more reservists in large regions. Alternatively, to test whether implementation differences were overriding the treatment effect, we

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[2] The statistical test is $\chi^2 = 2|L_1 - L_2|$, where
L_1 = log likelihood ratio of model with treatment and component,
L_2 = log likelihood ratio of model with regional dummies, and the degrees of freedom are df = $df_1 - df_2$. In this analysis $\chi^2 = 58$, df = 19, and p < .01.

consider each regional difference equally, i.e., small regions contribute to the estimate of the treatment effect as much as large regions. The regional effect, holding all else constant, is identified by the coefficient of the regional dummy variable. However, treatment and component are omitted from the model. Since we found significant component effects, and we are estimating treatment effects, both of these variables must be taken into account when estimating sources of regional variation.

To determine whether variability between regions can be accounted for by the offer of a bonus in some regions, a 2 x 2 ANOVA was performed (treatment by component). The observations in the ANOVA consisted of the 21 regression coefficients.

The results of the ANOVA indicated that only the component is a significant effect in describing the separation decision ($F = 5.68$, $p <$ .05). Although the treatment effect was positive and the same magnitude as in the first separation model, neither treatment ($F = 3.21$) nor the interaction of treatment by component ($F = 0.40$) was statistically significant at the 5 percent confidence level.

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